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# EDISON ELECTRIC INSTITUTE BULLETIN

## AUGUST, 1936

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EDISON ELECTRIC INSTITUTE

# STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

*Compiled Monthly by the Edison Electric Institute—Covers 100% of the Industry*

## DURING THE MONTH OF JUNE (Preliminary)

| | 1936 | 1935 | % |
|---|---|---|---|
| **Kilowatt-hours Generated* (Net)** | | | |
| By Fuel | 5,573,337,000 | 4,173,597,000 | +33.5 |
| By Water Power | 2,932,266,000 | 3,118,393,000 | − 6.0 |
| Total Kilowatt-hours Generated | 8,505,603,000 | 7,291,990,000 | +16.6 |
| **Additions to Supply** | | | |
| Energy Purchased from Other Sources | 172,341,000 | 193,740,000 | −11.0 |
| Net International Imports | 113,951,000 | 73,680,000 | +54.7 |
| Total | 286,292,000 | 267,420,000 | + 7.1 |
| **Deductions from Supply** | | | |
| Energy Used in Electric Railway Departments | 41,848,000 | 41,409,000 | + 1.1 |
| Energy Used in Electric and Other Departments | 109,900,000 | 113,827,000 | − 3.4 |
| Total | 151,748,000 | 155,236,000 | − 2.2 |
| **Total Energy for Distribution** | **8,640,147,000** | **7,404,174,000** | **+16.7** |
| **Energy Lost in Transmission, Distribution, Etc.** | **1,376,044,000** | **1,256,804,000** | **+ 9.5** |
| **Kilowatt-hours Sold to Ultimate Consumers** | **7,264,103,000** | **6,147,370,000** | **+18.2** |
| **Sales to Ultimate Consumers (kw-hrs)** | | | |
| Domestic Service | 1,144,307,000 | 1,059,338,000 | + 8.0 |
| Commercial—Small Light and Power (Retail) | 1,274,511,000 | 1,094,729,000 | +16.4 |
| Commercial—Large Light and Power (Wholesale) | 4,196,958,000 | 3,395,842,000 | +23.6 |
| Municipal Street Lighting | 159,124,000 | 152,435,000 | + 4.4 |
| Railroads—Street and Interurban | 346,241,000 | 331,473,000 | + 4.5 |
| Railroads—Electrified Steam | 74,498,000 | 65,022,000 | +14.6 |
| Municipal and Miscellaneous | 68,464,000 | 48,531,000 | +41.1 |
| Total Sales to Ultimate Consumers | 7,264,103,000 | 6,147,370,000 | +18.2 |
| Total Revenue from Ultimate Consumers | $164,007,200 | $151,436,900 | + 8.3 |

## DURING TWELVE MONTHS ENDING JUNE 30th

| | | | |
|---|---|---|---|
| **Kilowatt-hours Generated* (Net)** | | | |
| By Fuel | 61,563,896,000 | 52,981,067,000 | +16.2 |
| By Water Power | 36,722,931,000 | 34,109,595,000 | + 7.7 |
| Total Kilowatt-hours Generated | 98,286,827,000 | 87,090,662,000 | +12.9 |
| Purchased Energy (net) | 3,009,587,000 | 2,867,609,000 | + 5.0 |
| Energy Used in Electric Railway and Other Departments | 1,943,984,000 | 1,973,343,000 | − 1.5 |
| **Total Energy for Distribution** | **99,352,430,000** | **87,984,928,000** | **+12.9** |
| **Energy Lost in Transmission, Distribution, Etc.** | **16,450,303,000** | **15,055,789,000** | **+ 9.3** |
| **Kilowatt-hours Sold to Ultimate Consumers** | **82,902,127,000** | **72,929,139,000** | **+13.7** |
| **Total Revenue from Ultimate Consumers** | **$1,981,647,800** | **$1,874,423,400** | **+ 5.7** |
| **Important Factors** | | | |
| Percent of Energy Generated by Waterpower | 37.3% | 39.2% | |
| **Domestic Service (Residential Use)** | | | |
| Average Annual Consumption per Customer (kw-hr) | 697 | 648 | + 7.6 |
| Average Revenue per kw-hr (Cents) | 4.86¢ | 5.20¢ | − 6.5 |
| Average Monthly Bill per Domestic Customer | $2.82 | $2.81 | + 0.4 |

## BASIC INFORMATION AS OF JUNE 30th

| | | | |
|---|---|---|---|
| **Generating Capacity (kw)**—Steam | 23,966,500 | 23,731,860 | |
| —Waterpower | 9,011,600 | 8,950,319 | |
| —Internal Combustion | 499,400 | 501,364 | |
| Total Generating Capacity in Kilowatts** | 33,477,500 | 33,183,543 | |
| **Number of Customers** | | | |
| Farms in Eastern Area (Included with Domestic)*** | (626,271) | (545,053) | |
| Farms in Western Area (Included with Commercial—Large)*** | (233,767) | (214,107) | |
| Domestic Service | 21,333,916 | 20,815,457 | |
| Commercial—Small Light and Power | 3,777,444 | 3,747,876 | |
| Commercial—Large Light and Power | 495,783 | 505,135 | |
| Other Ultimate Consumers | 62,138 | 69,905 | |
| Total Ultimate Consumers | 25,669,281 | 25,138,373 | |

* By courtesy of the Federal Power Commission, with deductions for certain plants not considered electric light and power enterprises.
** Old Series both years—subject to revision to agree with data contained in Statistical Bulletin No. 3.
*** Includes a reclassification of 30,300 farm customers formerly classified as residential to adjust for differences in certain states of 1935 farm census data and company records.

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*The Edison Electric Institute does not assume responsibility for, nor necessarily endorse or approve, statements made by contributors to the* Bulletin.

EDISON ELECTRIC INSTITUTE BULLETIN

Volume IV AUGUST, 1936 No. 8

# The World Power Conference

THE privately operated electric utilities are cooperating actively in preparations for the World Power Conference. A number of leading executives from the industry have been actively engaged in planning and directing the Conference, and substantial financial contributions have been made toward defraying the expenses of the Conference.

Papers to be presented at the Conference include the following, prepared by executives of the industry:

*Organization of Private Electric and Gas Utilities*—James F. Fogarty, President, North American Company, New York, N. Y.

*Public Regulation of Private Utilities*—John E. Zimmermann, President, United Gas Improvement Company, Philadelphia, Pa.

*Planning for Conservation of National Resources*—W. S. Finlay, Jr., President, West Penn Electric Co., Pittsburgh, Pa.

*Planned Utilization of Water Resources*—H. G. Roby, Hydraulic Engineer, Byllesby Engineering and Management Corp., Chicago, Ill.

*Regional Integration Electric and Gas Utilities*—George N. Tidd, President, American Gas and Electric Company, New York, N. Y.

*Rationalization of Distribution of Electricity and Gas*—N. R. Gibson, Vice President and Chief Engineer, Buffalo, Niagara and Eastern Power Corp., Buffalo.

*Rural Electrification*—Hudson W. Reed, Management Engineer, United Gas Improvement Company, Philadelphia, Pa.

*National Power and Resources Policies*—Floyd L. Carlisle, Chairman of the Board, Consolidated Edison Co. of New York, Inc., New York, N. Y.

The contributions from private industry are: $75,000 from the Edison Electric Institute, and $25,000 from the National Electrical Manufacturers Association. This sum, combined with an appropriation of $75,000 voted by Congress, will be used to finance the Conference, which is expected to draw some 3000 delegates to Washington, September 7-12. An estimated 700 persons will attend from abroad, representing 48 nations.

In announcing the contributions of the E.E.I. and N.E.M.A., Floyd L. Carlisle, Chairman, the Consolidated Edison Company, and Chairman of the Finance Committee of the Conference, pledged whole-hearted support on behalf of private industry, both in connection with the Washington program, and with the traveling program which will take 600 of the world's leading engineers on a series of study tours embracing America's greatest technical accomplishments.

Among those who have been active in work of the Conference Executive Committee, which has met regularly in Washington, are: Gano Dunn, President of the J. G. White Engineering Company; Daniel C. Green, President, Middle West Corporation; Frank D. Comerford, President, and I. E. Moultrop, Consulting Engineer of the Edison Electric Illuminating Company of Boston; William McClellan, President of the Potomac Electric Power Company; C. W. Appleton, Vice-President of the General Electric Company; C. E. Stephens, Vice-President of the Westinghouse Electric & Manufacturing Company, and Mr. Carlisle.

Concurrently with the World Power Conference, the Second Congress on Large Dams will be held at Washington.

The first Congress on Large Dams, held in Scandinavia in 1933, dealt with two major topics, namely, concrete and masonry gravity dams and earth dams. The second Congress will continue this discussion and deal with Special Cement; Design and Waterproofing of Shrinkage, Contraction and Expansion Joints; Study of the Facing of Masonry and Concrete Dams; Geotechnical Studies of Foundation Materials; Calculation of the Stability of Earth Dams.

The World Power Conference is designed to study the role of power in our modern civilization in all its technical, economic, social and political bearings, and to serve as a public forum for the interchange of data and ideas. The purpose of the conference as outlined in its Constitution is to consider how the sources of power may be adjusted nationally and internationally:

By conferences on technical education to review the educational methods in different countries, and to consider means by which the existing facilities may be improved.

By discussion on the financial and economic aspects of industry, nationally and internationally.

By conferences on the possibility of establishing a permanent World Bureau for the collection of data, the preparation of inventories of the world's resources, and the exchange of industrial and scientific information through appointed representatives in the various countries.

By considering the potential resources of each country, in hydro-electric power, coal, oil and other fuels, and minerals.

By comparing experiences in the development of scientific agriculture, irrigation, and transportation by land, air and water.

By conference of engineers, technical experts, and authorities on scientific and industrial research.

By consultations of the consumers of fuel and power and the manufacturers of the instruments of production of power.

The Washington Conference will be conducted as an international forum where all sides of the questions growing up around public and private power policies can be presented to the entire world on a basis of free and frank discussion without personalities, politics or propaganda.

### Program

In the carrying out of this program papers will be presented and discussed on the following topics:

Paper No. 1: Power Resources, Development and Utilization.

Paper No. 2: Significant Trends in the Development and Utilization of Power Resources.

Paper No. 3: Collection, Compilation, and Publication of Statistics with Particular Reference to International Use.

Paper No. 4: Organization of the Production, Processing, and Distribution of Coal and Coal Products.

Paper No. 5: Organization of the Production, Refining and Distribution of Petroleum and Petroleum Products.

Paper No. 6: Organization of the Production, Transportation and Distribution of Natural and Manufactured Gas.

Paper No. 7: Organization of Private Electric and Gas Utilities.

Paper No. 8: Public Regulation of Private Electric and Gas Utilities.

Paper No. 9: Organization, Financing, and Operation of Publicly-Owned Electric and Gas Utilities.

Paper No. 10: National and Regional Planning and their Relation to the Conservation of Natural Resources.

Paper No. 11: Conservation of Coal Resources.

Paper No. 12: Conservation of Petroleum and Natural Gas.

Paper No. 13: Planned Utilization of Water Resources.

Paper No. 14: Utilization of Small Water Powers.

Paper No. 15: Regional Integration of Electric and of Gas-Utility Facilities.

Paper No. 16: Rationalization of Distribution of Electric Energy and of Gas.

Paper No. 17: Rural Electrification.

Paper No. 18: National Power and Resources Policies.

Each paper will consist of individual contributions by the representatives of several nations. Summaries of these papers have been prepared and copies in each of the official languages will be available prior to the meeting. The papers will be presented by title only so as to allow for the full discussion. Arrangements have been made for the instant translation of all discussion into French, German, English and Spanish, regardless of the language used by the discusser.

In view of the economic nature of most of the papers on the program and to allow detailed study of American engineering accomplishments, nine separate technical study tours have been arranged in connection with Conference. The Edison Electric Institute is one of the organizations sponsoring the tours. Prior to the conference the following study tours will be made:

Tour No. 1—which deals with coal, oil, gas and internal combustion engines, will visit New York, Detroit, Cleveland, Pittsburgh and Washington. Period Aug. 31-Sept 6, approximate cost $105.

Tour No. 2—which deals with dams, hydro plants, hydraulic research, Tennessee Valley development and larger amplifications of hydro development, will visit New York, Boston, Niagara Falls, Pittsburgh, Zanesville, Tennessee Valley and Washington. Period Aug. 28-Sept. 6, approximate cost $152.

Tour No. 3—which deals with steam plants, electrical equipment, transmission, distribution, engineering education and research, and business management, will visit New York, Schenectady, Niagara Falls, Cleveland, Detroit, Chicago, Pittsburgh and Washington. Period Aug. 27-Sept. 6, approximate cost $148.

Tour No. 4—which deals with railroad transportation including diesel and steam locomotion, electrification, terminal and road operations, design and building equipment, will visit New York, Schenectady, Chicago, Pittsburgh and Washington. Period Aug. 28-Sept. 5, approximate cost $154.

The above four tours will be repeated with minor modifications after the conference, and in addition a tour No. 5, dealing with major construction projects, will visit Montreal, Ottawa, Niagara Falls, Chicago, Fort Peck Dam, Grand Coulee Dam, Seattle, Bonneville Dam, San Francisco, Los Angeles, Boulder Dam, Grand Canyon and the Tennessee Valley. This tour will begin Sept. 14 and end Oct. 5. Cost ranges $275 to $377 depending on Pullman accommodation and whether or not TVA stopover is desired.

Although these tours have been designed primarily to show the foreign engineers American accomplishments and practice, there has been much interest by American engineers in these tours and already there is a large registration of American engineers for the tours. Following each tour a round table conference will be held for the purpose of thoroughly discussing and reviewing all of the points covered on the trip.

### Panorama of Power

At Washington a "Panorama of Power" will also be assembled in connection with the Conference.

Sponsored by private industries, trade associations, the government, and engineering organizations, the Panorama of Power Exposition will present in dramatic form the story of the development of America's vast power resources during the past fifty years, and will picture the machinery which supplies electric energy to one hundred million people.

The latest refinements in electric lighting and various electric devices will be exhibited at the Mayflower Hotel by the Edison Electric Institute, the Illuminating Engineering Society, and the Electrical Testing Laboratories. There will also be a special exhibit by the oil industry.

Also at the Mayflower, the following organizations will have exhibits: American Engineering Council, American Telephone and Telegraph Co., with the Chesapeake and Potomac Telephone Co., Diesel Engine Manufacturers Association, National Research Council, Tennessee Valley Authority, U. S. Bureau of Mines, U. S. Bureau of Reclamation, U. S. Forest Service.

In the New National Museum the following organizations will have exhibits: American Boiler Manufacturers Association, American Gas Association, Federal Power Commission, municipal power groups, National Electric Manufacturers Association, National Coal Association, Public Works Administration, Rural Electrification Administration, United States Army Engineering Corps, United States Bureau of Reclamation, United States Geological Survey.

The World Power Conference was organized in 1923 at the initiation of the late D. N. Dunlop of Great Britain. Since that date the following meetings have been held:

1924 — June 30-July 12 — First Plenary World Power Conference at London, in connection with the British Empire Exhibition at Wembley. About 1700 members present. This conference discussed the entire subject in a broad way and formed a background for a later conference.

1926—Sectional conference at Basle, 200 members present. Topic: Water Power and Inland Navigation.

1928 — Sept. 24-Oct. 6 — Sectional conference, London. Topic: Fuels.

1929 — Nov. 15-23 — Sectional conference, Barcelona. Topic: Complete utilization of water power sources.

1929 — Oct. 29-Nov. 7 — Sectional conference, Tokio. Development of power sources.

1930—June 16 to 25—Second Plenary Conference. Berlin. 4000 members present. Topic: The Distribution and Utilization of Power. There was discussion of power sources, production, transmission and storage, utilization and of legislative, educational, statistical, economic and research problems.

1933—June 26-July 20—Sectional conference, Stockholm. Under the auspices of the Committees of Sweden, Denmark, Finland and Norway. Topic: The Power Questions of Large Scale Industry. First Conference on Large Dams.

1936—June—Sectional conference at London—a Chemical Engineering conference.

# "—and Incidentally Electric Service"

**By George M. Gadsby**

*President and General Manager, Utah Power & Light Company*

An address before the Annual Roundup of Engineers, University of Utah

THE topic selected for this discussion has purposedly been left with an open end antecedent; to the predicate title there will be affixed a group of subjects with a certain degree of continuity.

In order that you may know the objective to be attained, let me explain that the purpose will be to delineate the function of electric service, showing that electric energy *per se* is both the primary raw material used in producing a marketable product and at the same time this energy is worthless except as an agency in the performance of service. In order properly to evaluate the place of electricity in the broad field of industry let us have some background material.

While realizing that this audience is in large part comprised of engineers and students familiar with the proper definition of terms, I am going to recall the exact meaning of three words in the parlance of the electrical industry. First Energy which is the capacity for performing work. It may be potential in the form of water at an elevation or latent in the form of coal in the bins waiting to be burned under the boilers. In either event the worth of energy is measured not in its own units but in the value of its accomplishment when applied to productive work.

Power is the rate at which mechanical energy is exerted or work performed. Power is therefore one step further along the sequence of events which must occur in giving value to energy.

Service is a broad term covering the entire field of results after the application of energy through motion or heat. I know of no word carrying such an overload as service. One would think with the great number of words resting undisturbed in our dictionaries we might have a few more for use where needed, and I know of no instance greater than the desirability of separating the manifold meanings of this word service. As used here it will cover the final result and purpose of the generation, transmission and distribution of electric energy. It is the only sales product of the electric company, and much of the confusion which has come about through intricate rate schedules and lack of public understanding arises from the difficult if not impossible attempt to measure service in units of kilowatt hours.

Still in the field of background material, but advancing to the point of attaching the first subject to our predicate title, let us visualize the Structure of Business—and incidentally electric energy. The fabric of industry is comprised of a warp of certain primary and entirely self-sustaining types. These are agriculture, mining, including in this term all extraction of material from the earth's surface, construction, and manufacturing. Any one of these can proceed alone without ancillary service. The weft of the industrial fabric consists of service activities. The most important of these are transportation, communication and power. These latter types are entirely dependent upon the former, without them they cannot exist. None are self-supporting. Admittedly this is stripping the tapestry down to its foundation threads. Our modern complex society with its great production units could not continue in its present form without the close interweaving of warp and weft, but the fact remains the functions of communication, transportation and power are all incidental. Distribution and marketing are not entering into this discussion.

The purpose in emphasizing the ancillary position of electric power is not the result of an inferiority complex, but because of the need of recognizing the relative importance of many factors which comprise industry.

In the recent past there have been loud and long proclamations about the need for cheap power and its almost sole responsibility for producing the abundant life. Admittedly the lower the cost of any raw material or any part in the process of production the lower may be the price of the finished product going to the consuming public. Admitted further is the desirability of price reductions when brought about by efficiency and not at destructive cost either to labor or legitimate profit. In the ordinary industrial operations the cost of power is scarcely enough to affect the selling price of the manufactured article in the second decimal place. Electric service is in a highly competitive market and its price for industrial uses is sharply limited by the cost of producing power by other means. With a few notable exceptions such as electrolytic and electrochemical plants the offer of absolutely free power would not much affect the establishment, growth or migration of industry.

A few years ago some very careful studies were made along this line and it was found that the ranking reasons for all industrial gains in the various locations of the United States are, in the order of their importance, as follows:

1. Proximity to market.
2. Labor conditions.
3. Cost of transportation of raw materials and finished product.
4. Availability of materials.
5. Available factory building and site.
6. Personal reasons.
7. Cost of power and fuel.
8. Cost of land.
9. Grouping of related industries.
10. Living conditions.
11. Financial aid.
12. Taxes.

For years probably the cheapest source of reliable power on this continent has been Niagara Falls, and yet the territory adjacent to the Falls has shown no phenomenal growth. The automobile industry came long after the establishment of those great hydro plants, but it went to the area centering in Detroit. The rubber industry went to Akron. The brass industry stayed in New England. The migration of the textile industry was not from New England to a cheaper source of power, but from New England to the south where it was closer to the raw material and a cheaper source of labor. The threatened competition, of which we now hear a great deal, of the government operations at Boulder dam or Bonneville, will have to run counter to past experience if there follow a grouping of non-electrical industry

about either location at the expense of neighboring territory not equally blessed through the beneficent outpouring of the money of the federal taxpayer.

As a matter of fact locally the greatest limiting factor of future growth is an adequate water supply.

Perhaps if a list of industrial influences were to be prepared today, near the top would come the attitude of the state or community toward its existing industries as demonstrated by the record on taxation, legislative regulation, local patronage and general fairness reflected in a sympathetic understanding. The doctrine of confiscation and unequal distribution of taxation will bar industrial growth to an extent that could not be overcome if you were to furnish free power and even put a bounty on its use.

Eighty per cent of plant locations are determined by private investigation and independent surveys. Fifteen per cent are influenced by community advertising and activities of civic organizations. The remaining five per cent are due to personal and miscellaneous reasons.

The important things to be done by any state or community desiring new industries is to establish and maintain its character for fairness, sanity and appreciation of its existing enterprises. Such a reputation will be a foundation which will be attractive to new concerns and promote the growth of those already under way.

Industries are not brought in, they come in when conditions are inviting.

Certain of our primary activities are of necessity limited in their location. Agriculture, while widespread, is of varied character and is determined by climate, soil, water and marketing conditions. Mining is determined by location of deposits. Construction follows industrial development, and only the fabrication of materials and manufacture is really foot-loose and capable of selective choice in location. In ordinary manufacturing power costs seldom exceed 5 per cent, and probably average nearer 2 per cent. The reliability of service and flexibility of capacity to meet the varying needs in the industrial plant are of far greater importance than its actual cost. To illustrate, a variation of 3 cents a bushel for wheat will wipe out the entire power cost of producing a barrel of flour. Just the increase in the annual cost of foods between March, 1933, and March, 1935, has been five times the 1935 residential and farm electric bill for the entire nation. The deficit in our federal budget for any one year, between 1934 and 1937, would pay one and a half times for every kilowatt hour of electric energy used for every purpose of every kind and character in the United States.

So much for the structure of business, and incidentally electric energy.

The next antecedent is the development of Utah. Within the boundaries of Utah there are approximately 53,000,000 acres. 1,800,000 of these are water. Of the remaining land area about one-half belongs to the National public domain, one-sixth is in reservations in the major part formed by National forests, Indian reservations, National parks and Naval oil reserves. Lands withdrawn from entry for various reasons amount to one-seventh of the total area. About four-fifths of the entire land area therefore belongs to the public at large, mostly the National Government. Only 3 1/3 per cent of the entire land area or about 1,750,000 acres are farmed. Of this acreage approximately 1,375,000 acres are irrigated and the remainder is in dry farms. Of the irrigated area only 300,000 acres have a full water supply. Less than 700,000 have a half supply, and the remainder only one-fourth of a sufficient amount. The purpose in citing these figures is to show that while Utah was first settled as an agricultural state and the intrepid pioneers who first made permanent homes in the Great Salt Lake Basin planned an agricultural development, the opportunity for growth and the support of any sizable population by agriculture is impossible. With the discovery and development of the mineralized areas mining has surpassed agriculture as the wealth producing activity in the state. Mining brought electric energy.

In any discussion of electric power in Utah the name of L. L. Nunn is inevitable. Would that time would permit even a brief review of his colorful life. A very small man, slightly over five feet in height and weighing but 115 pounds, who survived the dangers and ordeals of a restaurant business in Tombstone, Arizona; the construction of shacks in and about Durango, Colorado; a typhoid attack without medical care in a tent in the mountains of Telluride, Colorado; and finally embarking in mining operations himself. Mining required power and the cost of power produced at the mine near the top of mountain peaks was exceedingly costly. Unfortunately the metal deposits and water power sites just would not occur together. In order to transmit energy from a location where falling water was available Mr. Nunn turned to the problem of conveying the power for several miles up the mountain side from power site to ore deposit. He had seen street cars propelled miles away by the use of steel haulage cables. He had seen power conveyed through compressed air and had also seen the early transmission of electric energy over direct current circuits. The haulage and compressed air methods were palpably not feasible. The use of direct current involved conductor costs which were prohibitive. His mind therefore turned to the use of alternating current, which at that time had only been under discussion for about three years. With the courage which characterized all of his undertakings he decided to install a 3000 volt single phase system capable of transmitting 100 horsepower from generator to motor. The site selected was at Ames, Colorado, where to this day is operated one of the plants of The Western Colorado Power Company. So far as the transmission of electric energy was concerned the scheme worked. Operation, however, was made difficult and often interrupted by snow slides, variations in load caused by erratic speed and voltage troubles and the choking of the power plant water supply by ice. On the whole, however, the plan succeeded and resulted in the close association of electric power and mining operations in the mind of Mr. Nunn.

A little more than forty years ago he first came to the mining camp of Bingham and immediately went across the valley and acquired water rights on the Provo River for power generation. He built a 2500-hp. plant near the mouth of the canyon and constructed 35 miles of 40,000-volt line, which up to that time was the highest voltage transmission ever constructed. Following this he purchased the Hercules electric plant in Logan canyon which was his first venture in domestic and municipal service. Then followed the beginnings of the Bear Lake and Bear River development; the Madison River project in Montana with its power transmission to Butte; the Beaver River in southern Utah, and the Malad River in Idaho taking power to Boise. The most elaborate local plan carried out by Mr. Nunn and his interests was the construction of the hydro-electric plant at Grace, Idaho, and the 44,000-volt duplicate circuit transmission line through Cache Valley into Salt Lake.

During the same years along the streams and in the canyons many other small plants were built, as a rule consisting of one power station and a local distribution system. The Knight Con-

solidated Power Company built transmission lines in Salt Lake and Utah Counties, and the Utah Light & Railway Company also constructed a combination steam and hydro system extending from Cache Junction on the north to the Salt Lake City area on the south. At the time these various plants and systems were built the requirements for service were much less rigorous than now. The principal domestic requirement was for lighting, so day-time interruptions were not serious.

In 1912 Mr. Sidney Z. Mitchell, through a wholly-owned subsidiary of the General Electric Company, was building up potential power equipment markets and attempting to make good paper taken for electrical machinery furnished over the western part of the United States. Coming into the intermountain territory he visualized the great possibilities for a unified power company if an interconnected system were constructed capable of giving reliable service. As a result of that vision and the efforts of himself and a few associates most of the many and various small operating companies were consolidated by purchase or lease into the Utah Power & Light Company. After purchase of the predecessor companies many millions of dollars were secured and spent in the construction of heavy transmission lines and the building of new power plants. The Bear River system was built to the point of securing complete stream flow regulation as well as providing a source of irrigation upon which approximately 125,000 acres depend. The story of this accomplishment and the very concrete results, particularly of the past few years, constitute an almost epic narrative, but time permits the merest mention of the final accomplishment.

The streams in this section of the intermountain territory cannot be classed as primary power sources, that is, no one of the streams alone is capable of producing power to an extent and with a reliability sufficient to make it constant. Brought together through interconnecting transmission lines the reliability of the system is greatly improved, but even then there is required the support of steam plants to tide over periods of insufficient precipitation and to aid in the broad program of conservation of water supply for irrigation. Water is so precious for culinary and irrigation purposes that its use for power must be subordinate. Irrigation and power use cannot be synchronized throughout the year. No better demonstration of this can be found than the experience at American Falls where drastic revisions of the arrangements between irrigation and power use have been necessary within the past three years. Contracts carefully negotiated just ten years ago were found to require the use of water in winter months which could and of necessity had to be stored for irrigation in the following summer months. The power companies depending as they do upon success of their users must not only cooperate but often yield any questioned rights in order that the farmers and others dependent upon stored waters may not suffer. Recent examples of this character have occurred in the cooperation between water users and the Power Company to conserve winter flow in the Echo reservoir on the Weber River. Another recent instance is the contract made with an irrigation district in Idaho whereby winter water available for the Ashton plant on the North Fork of the Snake River will be reduced one-third in order to fill the new Island Park reservoir now under construction by the Bureau of Reclamation. The need for this type of cooperation is constant and is exercised with a minimum of friction and disagreement to the end that the water may fulfill its double duty of producing power and irrigating the land —with its conservation always paramount. Even with all this care and the skillful work that has thus far been done to further irrigation, the figures already given show that a relatively small amount of the total land in the state is or ever can be devoted to agriculture.

The other great resource is our metals and coal deposits. In the development of these resources electric service has played a most important part. The deposits are mostly found in locations where the development of power by means of steam would range from very costly and difficult to impossible. Electricity is particularly adapted to such situations as the pole lines can be built over mountains and across canyons conveying enormous quantities of energy efficiently to the remotest points of use. This entire area is thoroughly covered with substantial transmission lines. It may correctly be stated that without adequate, reliable electric service much of the natural wealth of our state would remain locked in the vaults of our mighty mountains, and this leads directly to the third topic of our discussion.

Very briefly the Interconnected Power System—and incidentally electric energy —will be presented. There has already been shown the transition from many isolated plants and a few more ambitious systems into one strong interconnected power development. The systems of the present three major companies in Utah extend north and south through the state. There is an inter-connection at American Falls and Pocatello with the system of the Idaho Power Company which extends westward across Idaho and into Oregon and Nevada. Interconnection with the Telluride Power Company and between it and the Southern Utah Power Company are used entirely for delivery of energy to those southern companies. The interconnection at American Falls is used for the exchange of service and the delivery of large quantities of hydro power into the system of the Utah company when it is not required by the Idaho company.

As engineers you may be interested in the query as to the justification for the Bear River system, in the light of recent years of sub-normal precipitation. The Bear River system is constructed with relatively large pondage at Soda and Cutler, and further opportunities for some stream regulation at Grace and Oneida. During the irrigation season the amount of water in the river is solely and entirely controlled by irrigation requirements. The supply in Bear Lake for years past has not only been conserved for this purpose, but practically all of the winter flow in the river has been diverted into the lake rather than being permitted to pass down the river and through the series of power plants. This water has therefore been profitably stored rather than permitted to waste into Great Salt Lake, which must have been the case had the Power Company's Bear River development not been made. With the pondage available and the ability to regulate the flow between Bear Lake and the Cutler Plant, there is a peak carrying capacity in the Bear River system of 94,000 kilowatts. After the irrigation season is over the Cutler Plant is put in operation utilizing make-up water in the river below Bear Lake. The peak carrying capacity is then somewhat increased.

Consider the load chart of a typical day. As the load increases from the early morning hours until noon and again during the evening hours the plants on the Bear River come into operation. During the few hours of maximum load water may be passed through the wheels at a faster rate than the stream flow. The level in the ponds is reduced, then after the load decreases the water is held back again and reservoir levels restored. Thus peak loads of

many times the continuous flow capacity may be carried by these plants day after day without loss of any water which could otherwise be used or stored.

These plants also serve as relay or emergency protection in case of accidents to other plants or transmission lines. A few typical actual examples may illustrate how the Bear River plants operate for the protection of the entire system.

In the early morning of February 25, 1936, an arc occurred between the two strings of insulators on one of the towers in the Terminal-Wheelon section of one of the 130,000-volt transmission lines. The insulators on this tower had been damaged by gun shot. The immediate cause of the flash-over was a severe rain and wind storm. All of these lines are protected by switches, which, in the event of such damage, trip them out of service. The switches opened both at Terminal and Wheelon, cutting out the defective section, but the shock of the transferred load was so great that the Idaho Power system pulled out of step and the switches opened at American Falls. At the same time the transformer switches at Jordan opened because of the heavy load momentarily imposed, thus separating the 25,000-kw steam unit from the general system, although it was still carrying the Salt Lake load. With these lines open there was a practically instantaneous tripping of load amounting to 38,000 kw. At the time the only load being carried on the Bear River system was 1600 kw at Cutler. Following the usual practice the units in the other plants were either floating on the line or ready for immediate use. As soon as interruption occurred, the two units at Cutler and one at Oneida immediately went into service and within three minutes additional generators at Soda and Oneida were on the line to the full extent necessary to carry the load and not a customer was interrupted nor had knowledge of the occurrence, except as may have been indicated by momentary voltage dip.

Again in January, 1935, during a severe fog condition a three-phase short circuit occurred on the 44-kv line between Terminal and Midvale, caused by insular leakage which set fire to the pole top, permitting the conductors to swing together. This heavy short circuit being so near to the Terminal substation caused a severe disturbance which resulted in the Idaho Power Company's system pulling out of step and separating at American Falls. Again the transformer switches at Jordan opened, separating the 25,000-kw unit from the system. All of this is perfectly normal operation, the switches being designed to open under these conditions in order to protect the units from overload damage. At the time no load was being carried on the Bear River system. 36,000 kw were almost instantaneously dropped and the whole load in the same instant picked up by the Bear River plants without interruption to a single consumer.

Other instances might be cited, but these two will suffice to show the tremendous system value of the Bear River system even when, for water conservation reasons, the plants are not generating but are kept either floating on the line or ready for immediate service. It is true that when the system was built all stream flow records indicated that an almost continuous supply of water would be available. It may safely be said, however, that even had the dry cycle been foreseen, the construction of these plants would have been justified both for the large kilowatt hour output during irrigation season and their relay value during the winter months when stream flow has been so limited. Over the years the system operators have learned how to utilize this system and plants so that the maximum energy from whatever water is available may be secured.

The steam capacity of the system is now being further increased by the new plant at the mouth of Provo canyon, which will have a maximum capacity of 18,750 kw, 25,000 hp. The investment in this plant is substantially reduced by the fact of the Bear River system. A single unit is being installed consisting of one boiler, one turbine, and one bank of transformers. No relay capacity is needed at this steam plant because it is fully backed up by the temporary capacity automatically ready to swing into service in the Bear River plants.

In general there are four major sources of power available to the system, all of which produced a total of 586,000,000 kilowatt hours in 1935. The division among these four sources was as follows: First, the Bear River plants, which furnished 129,000,000 kilowatt hours, or 22 per cent of the total; interchange connections, principally with the Idaho Power Company, furnished 197,000,000 kilowatt hours, or 33.6 per cent; small stream plants, including some 22 hydro stations on the canyon streams from Santaquin to Logan, and on the upper Snake River at Ashton, St. Anthony and Idaho Falls, a total of 153,000,000 kilowatt hours, or 26.2 per cent; Jordan steam plant which furnished 107,000,000 kilowatt hours, or 18.2 per cent. The small stream plants are not capable of regulation, that is, they generate according to the water in the stream at the time. There is, however, considerable diversity and the total capacity usually ranges from a minimum of 9000 to a maximum of 25,000 kw. The other three sources are susceptible of considerable regulation and by skillful system operation are used so as to turn into the system always the lowest cost energy at the time available. Maximum economy of steam is secured by using it as the base load plant; the Bear River system makes an ideal reservoir to provide for the peak loads, with interchange power from the Idaho Power Company's system filling in between. Every section of the transmission system is protected by switches, mostly automatic, so that when accidents occur the section affected is cut out and redistributed among stations in the manner already illustrated.

To an intelligent audience such as this the benefits of an interconnected power system need not be emphasized. It is unfortunate that for political reasons and in the furtherance of the theory of socializing a great industry, use is now being made of federal money to turn back technical engineering development and persuade municipalities to return to the isolated plant of years gone by. In a recent statement, Secretary Ickes announces that allotments of federal funds to the extent of over seventy-six million dollars have been made for non-federal electric projects. These allotments have but little reference to unemployment relief, as the amount of actual local labor involved ranges from 10 per cent to 20 per cent of the total cost of the projects. At the same time over one hundred and fifty millions have been allotted to federal projects for electric power purposes, which, while in large measure duplicating existing investment, are for power developments of greater magnitude and therefore not subject to the same criticism of technical retrogression as is unmistakably evident in the smaller allotments. In time most of these isolated plants, being contrary to economic law, will disappear, just as they have in the past, but every person in this audience will be helping to pay for them during the rest of our natural lives.

With this background of the place of electricity both in the business structure and in the intermountain territory; then the picture of the facilities available for all types of local requirements, may we

proceed briefly to analyze the nature of our sales product.

The antecedent this time will be the Electric Service Package—and incidentally electric energy. It has already been stated that electric energy as, of and by itself, is not a marketable thing. It has neither form nor substance, weight nor magnitude. It is simply an agency convenient for the transfer of a type of energy into the production of work by light, heat, motion, or electrolytic action. What people really buy is the accomplishment of the manifold tasks of electricity.

After the conversion of the falling water or the heat content of coal into electricity at the power generating station the process of creating a marketable product has but begun.

Much argument has raged about the spread between or cost of a kilowatt hour at the power plant and the selling price of a kilowatt hour delivered at the consumer's meter.

The average price received from ultimate consumers in U. S. A. per kilowatt hour delivered at their meters in 1935 was just under 2½ cents. No national data are available for average production cost, but it would not be less than 3 mills, or a spread of about 1 to 8 from raw material at the mill to finished product wrapped up and delivered inside the door, just as required, day and night through 8760 hours of the year.

Rough sawn lumber at the mill costs $20 per M board feet. Converted into a 6-room frame house ready for occupancy the same lumber is worth $400 per M, a 1 to 20 spread. A walnut log at the mill costs about $135 per M, but when you buy it as walnut veneer furniture you will pay at the rate of $17,500 per M, a spread of 1 to 130. Yet in each instance a raw ingredient has had much labor, skill, investment, and refinement added to make it into a useful thing and bring it to the user.

For years we have devised rate schedules incomprehensible to the public and really understood only by the rate experts of the Power Company. We have talked in our own language and tried to educate a public which has troubles of its own. Only recently have we come to a realization that we must offer the public our services translated into the language it understands, at the same time endeavoring to simplify our rates to the greatest possible degree. Most people have occasion to think only in terms of commodities, and perhaps in no other major industry does there exist the same difficulty of interpretation as there is in attempting to think of washing and ironing in terms of kilowatts, volts and amperes. If you say a kilowatt hour may be purchased for ten cents or for five mills, it registers nothing to the ordinary purchaser, because that purchaser has no way to convert a kilowatt hour of energy into so many equivalent pounds of ice, or so many lumps of coal, or so many hours of sweeping and dusting. On the other hand, if we can fix a reasonably accurate price at which these services may be performed by electricity for a period of a month, we then approach the customer in understandable terms. This change in policy is having effect and the old idea of the "Electric Light Bill" is gradually passing.

The present day monthly bill of the electric service company is a rather interesting package of diverse contents. To begin with it includes a wide variety of service having nothing to do with lighting. It is the cost of sweeping, laundry, including both washing and ironing, food preservation and food cooking, the manufacture of ice cubes of equal serviceability whether mixed in the glass the night before or applied in the ice cap the morning after; more and better lighting of course comes in the package with its saving of eyestrain and bodily fatigue; water heating with all its manifold uses and now air-conditioning are becoming more frequent articles in the package.

Over and above all of these direct services, however, which are generally recognized as a part of the bill, there are a great many unseen items to be found only in the Power Company package. No reference is made to the fine school building, some parts of which are included in the electric bill. There is not a building on this campus, with the possible exception of the new Library, to the construction of which the monthly electric bill did not contribute. There is not a function of government which is not in part paid for when you pass your money in to the electric company teller. In order concretely to bring out this point a study has been made of tax payments for the fifteen years ended with 1935 which show that the Utah Power & Light Company and its subsidiaries operating within the state, paid for school purposes over $6,000,000. Of this over two and one-quarter millions went into the state school funds and the remainder into the local school districts. Three million dollars went for the maintenance and support of the schools, and $800,000 for interest and sinking fund in buildings and grounds account. In other words, when you pay the electric bill you are purchasing not only the manifold services of electricity, but you are paying the salary of teachers, building new high schools and grade schools, and through the funds collected for state purposes, in like manner paying a part of the construction and operation of the institutions of higher learning. Utah schools are a source of pride to every resident of the state, and we are very willing to serve in this capacity as collector for them, but we do wish our patrons could understand that for their electric service bill they receive in return a substantial part of the benefits of our educational system as well as electric service. The school taxes are of course only a part of the total amount paid, so the electric service package also contains a part of all the functions of state, county and municipality. In the year 1935 16½ cents of every dollar paid to the Utah Power & Light Company went to pay for education and government, so that one-sixth of the entire package you purchase at our windows is government and educational institutions.

The present efficient and convenient apparatus for the use of electricity has not come upon the markets full blown in its beauty and usefulness. Many years of work have been required and many more years have been devoted to the development of public acceptance of these appliances. The power companies have played a leading part in extending the field and bringing to their present state of perfection, or even imperfection, the electric refrigerator, the bright and shining range, and the drudgery-eliminating water system and utility motors on the farm. It is true these appliances have brought about wider use and in turn wider use has made possible lower rates. None the less, in the electric service package there is the development and promotion of the electric appliance. Another relatively small, but highly important item, is the contribution to civic and charitable undertakings. By caring for the unfortunate and by promoting proper advertising and industrial promotion programs in our various communities, every citizen is benefitted. The public utility properly takes a part in these programs both through the services of its individual employees and by direct contribution. Tucked away in the package, therefore, there is a small amount of public welfare and civic promotion. In recent years the utilities have been among the leaders in accident prevention and safety first training. A majority of the employees receive first-aid

instruction and many cases are of record in which lives have been saved by the appearance on the scene of accidents of skilled men and women who have received their training on time paid for by the electric company. It may not be fair to say that there is a cost element in this because statistics prove the direct saving to the company exceeds the cash outlay for this work, none the less it is a component part of the package and whether you realize it or not you are under some measure of protection by reason of the training of these employees.

At this point let us take just a moment to compare the private company package with that offered by the publicly owned system. The TVA is well known to every person in the land who reads the daily newspaper. It is held forth as the yardstick for measuring a proper cost of rendering electric service. Let us change the metaphor and visualize two packages both purchased with the electric service dollar, one from the private company the other from TVA. This comparison may readily be made by a brief study of the TVA report just issued for the fiscal year ended June 30, 1935. The average price received for electric energy sold by the TVA to all outside purchasers was 1.54 cents per kilowatt hour. This included direct sales to municipalities, to county power associations and large blocks to other electric corporations. Sales in each instance were made in wholesale blocks. Wrapped up in this package are found no promotional activities, because these were taken care of by funds secured from the Federal Treasury and directly allotted to sales promotion work through the Electric Home and Farm Authority, which during the fiscal year in question had in its budget over $100,000 for promotion and dealer contacts and another $100,000 for educational programs; $11,000 for research and $1,000,000 for financing customers' purchases of equipment. Taxes were charged in only a nominal amount, being calculated at the rate of 5 per cent of the wholesale price of energy sold by the TVA. While the report does not set forth the exact amount of taxes, they were actually about $17,000 as against $800,000 that would have been paid by a utility company with the same actual investment in power facilities. In fact there is nothing in the TVA package except electric energy and the public is asked to believe that that package should be used as a balance weight against the one containing all of the items which have just been enumerated.

(*Continued on page 336*)

## SALES—ELECTRIC REFRIGERATORS

(*Household Models Only*)

MONTH OF JUNE AND FIRST SIX MONTHS OF 1936-1935

| | Month of June 1936 | Month of June 1935 | Month of May 1936 | First Six Months 1936 | First Six Months 1935 |
|---|---|---|---|---|---|
| *Total United States* | 237,371 | 161,525 | 329,140 | 1,441,559 | 1,105,473 |
| Maine | 1,321 | 936 | 1,570 | 6,471 | 5,959 |
| New Hampshire | 754 | 759 | 1,514 | 5,669 | 4,299 |
| Vermont | 679 | 466 | 984 | 3,695 | 2,619 |
| Massachusetts | 8,725 | 7,038 | 12,508 | 57,125 | 45,080 |
| Rhode Island | 931 | 958 | 1,626 | 7,605 | 5,771 |
| Connecticut | 3,465 | 2,211 | 5,789 | 23,780 | 16,116 |
| *Total New England* | 15,875 | 12,368 | 23,991 | 104,345 | 79,844 |
| New York | 24,955 | 20,009 | 34,326 | 151,563 | 115,474 |
| New Jersey | 8,954 | 7,890 | 11,667 | 61,576 | 47,871 |
| Pennsylvania | 22,099 | 12,587 | 33,660 | 131,966 | 88,191 |
| *Total Middle Atlantic* | 56,008 | 40,486 | 79,653 | 345,105 | 251,536 |
| Ohio | 17,208 | 9,490 | 25,832 | 94,319 | 68,351 |
| Indiana | 6,531 | 4,202 | 10,019 | 41,172 | 29,068 |
| Illinois | 16,663 | 12,381 | 31,215 | 108,594 | 84,118 |
| Michigan | 11,413 | 5,677 | 23,200 | 70,708 | 47,014 |
| Wisconsin | 3,542 | 2,326 | 7,088 | 25,961 | 19,032 |
| *Total East North Central* | 55,357 | 34,076 | 97,354 | 340,754 | 247,583 |
| Minnesota | 3,195 | 1,643 | 5,098 | 19,896 | 17,161 |
| Iowa | 3,411 | 2,530 | 5,409 | 23,131 | 20,061 |
| Missouri | 7,155 | 3,745 | 9,475 | 46,509 | 36,656 |
| North Dakota | 360 | 496 | 664 | 2,929 | 3,280 |
| South Dakota | 784 | 607 | 779 | 4,258 | 4,162 |
| Nebraska | 2,212 | 1,627 | 3,069 | 13,854 | 13,744 |
| Kansas | 3,119 | 1,938 | 3,415 | 18,395 | 15,883 |
| *Total West North Central* | 20,236 | 12,586 | 27,909 | 128,972 | 110,947 |
| Delaware | 398 | 338 | 651 | 2,706 | 2,602 |
| Maryland | 2,068 | 2,478 | 4,552 | 16,936 | 17,066 |
| District of Columbia | 2,215 | 1,143 | 2,682 | 12,428 | 8,958 |
| Virginia | 3,354 | 2,301 | 6,341 | 23,278 | 17,720 |
| West Virginia | 3,237 | 1,896 | 6,616 | 20,286 | 12,632 |
| North Carolina | 5,075 | 2,253 | 7,476 | 30,243 | 22,659 |
| South Carolina | 1,995 | 1,340 | 3,457 | 14,088 | 10,400 |
| Georgia | 5,771 | 4,038 | 6,644 | 26,231 | 21,756 |
| Florida | 2,491 | 2,471 | 2,508 | 14,798 | 15,688 |
| *Total South Atlantic* | 26,604 | 18,258 | 40,927 | 160,994 | 129,481 |
| Kentucky | 3,733 | 1,889 | 4,900 | 20,028 | 13,461 |
| Tennessee | 4,477 | 1,966 | 4,616 | 24,158 | 20,154 |
| Alabama | 2,697 | 2,367 | 2,945 | 16,943 | 19,016 |
| Mississippi | 1,334 | 638 | 1,498 | 8,223 | 5,871 |
| *Total East South Central* | 12,241 | 6,860 | 13,959 | 69,352 | 58,502 |
| Arkansas | 1,660 | 1,067 | 1,675 | 9,800 | 8,448 |
| Louisiana | 2,184 | 1,291 | 2,479 | 15,169 | 11,539 |
| Oklahoma | 1,691 | 1,487 | 2,478 | 16,083 | 14,715 |
| Texas | 11,137 | 6,331 | 9,112 | 59,903 | 51,027 |
| *Total West South Central* | 16,672 | 10,176 | 15,744 | 100,955 | 85,729 |
| Montana | 1,453 | 832 | 1,308 | 6,638 | 4,754 |
| Idaho | 1,323 | 1,147 | 1,190 | 7,358 | 5,754 |
| Wyoming | 448 | 344 | 392 | 2,074 | 1,896 |
| Colorado | 2,184 | 1,560 | 2,588 | 11,145 | 9,222 |
| New Mexico | 595 | 491 | 575 | 3,199 | 2,947 |
| Arizona | 719 | 756 | 385 | 5,359 | 4,917 |
| Utah | 1,726 | 1,486 | 1,746 | 9,286 | 6,341 |
| Nevada | 355 | 355 | 259 | 1,823 | 1,359 |
| *Total Mountain* | 8,803 | 6,971 | 8,443 | 46,882 | 37,190 |
| Washington | 4,838 | 2,262 | 3,695 | 23,941 | 16,631 |
| Oregon | 2.530 | 2,240 | 2,621 | 15,929 | 11,475 |
| California | 18,207 | 15,242 | 14,844 | 104,330 | 76,555 |
| *Total Pacific* | 25,575 | 19,744 | 21,160 | 144,200 | 104,661 |

(Figures based on report issued by the National Electrical Manufacturer's Association)

# The McGowan Report*

**By Alexander Maxwell**
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THE recent Report of the Committee on Electricity Distribution rendered to the Minister of Transport in Great Britain has elicited much comment in that country. The present status of this Report, it should be understood, is merely that of the Committee's recommendations to the Ministry. If legislative action ensues the provisions of the resulting bill may differ materially from the recommendations of the Committee, as was the case with the report of Lord Weir's committee in 1925 and the provisions of the Electricity (Supply) Act of 1926.

Apart from the specific recommendations of the Committee, the present report has special interest as an index of the scope and magnitude of the measures deemed to be necessary for the well-being of electrical distribution in Great Britain above and beyond, and in a sense supplementary to, the measures already taken in the domain of generation and bulk supply by the Central Electricity Board and the "Grid," all in the interest of an abundant supply of electric power and a reduction of its cost. The McGowan Report proceeds at least tacitly with the assumption that adequate bulk supplies at minimum practicable cost are available through the Grid.

In spite of the importance of the recommendations made in the Report none of them lead immediately to large governmental expenditures. It is evident from the text that a wide range of representations had been made to the Committee, from an unmodified *laissez faire* policy to urgent proposals for the complete or partial nationalization of the service of electricity distribution. The latter is reflected in the recommendations, if at all, only in provisions for the public acquisition of properties at the termination of long term franchises and these provisions are really not much more than restatements of existing provisions of law. On the other hand the recommendations contemplate the possible compulsory sale of publicly owned undertakings to privately owned supply companies.

In January, 1929, the Electricity Commissioners in Great Britain in their Annual Report, and following a description of the status of the "Grid" project at that time, made the following remarks under the heading, "Electricity Supply in Rural Areas":

"During the eight years which have elapsed since the reorganization of supply was commenced on the basis of the Act of 1919, it has become increasingly evident that the centralization of generation will require to be supplemented by improvement in and coordination of distribution if the opportunities for expansion presenting themselves to the supply industry are to be utilized to the fullest advantage.

"The costs of distribution, including capital charges, are second only in importance to the cost of generation as a factor in determining the ultimate prices at which electricity can be supplied to consumers and much scope for economy in distribution and technical and other improvements undoubtedly exists. The problems of distribution have already assumed special prominence in recent years in connection with two aspects of development, namely, the growth of the domestic load in urban centers and the demand for the extension of supply into the less populous rural areas."**

In the House of Commons on July 11, 1935, the Minister of Transport stated that the government had decided to appoint a committee consisting of Sir Harry McGowan, Sir John Snell, Chairman of the Electricity Commissioners, and Mr. John Morrison, Chartered Accountant, with the following terms of reference:

"To bring under review the progress of the distribution of electricity in Great Britain including the control of statutory electricity companies by other companies, to advise on methods in which improvements can be effected with a view to insuring and expediting the standardization of systems, processes and methods of charge, further extending facilities (including supplies in rural areas) and reducing costs, and to make recommendations."***

This Committee on Electricity Distibution, which was appointed in July, 1935, reported to the Minister of Transport on May 8, 1936.

### Considerations Leading to the Recommendations in the Report

The Report is informed throughout by an evident and earnest conviction that improvements in distribution economy must be achieved by measures calculated to encourage and insure efficient and progressive business management. The Report says at one place:

"In the case of distribution, while technical considerations still play an important part, commercial enterprise, including salesmanship, is, in our opinion, an even more important factor, and the keynote on which its success depends."

In conformity with this statement there are many instances throughout the Report where one measure or another under consideration is recommended or rejected according to whether it will or will not promote efficient and progressive management.

In discussing the measures to be recommended the Report deals with three principal categories of authorized distributors of electricity, the Local Authorities, the private distributing companies and the "Power Companies." It may be in order to describe these briefly since their powers and characteristics, and the opinions of the Committee thereon, provide the specific basis for many of the recommendations of the Report.

By Local Authorities is meant local governmental bodies such as municipal corporations, borough councils, urban districts and the like which, as authorized undertakers of electricity supply, correspond practically with "municipal ownership" in America. The Report notes that these undertakings characteristically serve strictly urban areas of small extent although often of high load density, conduct a decidedly retail type of business, supply little power or bulk load and have little benefit from diversity of loads. Account is also taken of the disinclination or inability of this class of undertakings to devote new capital to extensions or modernization especially where there is a possibility that profitable returns may be deferred. While the Report does not say so explicitly and it does point out the exceptions, it seems fairly evident that the Committee had not a very high opinion of the business capacity and enterprise of these undertakings, or of their value as instrumentalities in promoting a more efficient and progressive national policy.

The second category comprises those

*Report of the Committee on Electricity Distribution; May, 1936; Ministry of Transport, Great Britain.

**Eighth Annual Report of the Electricity Commissioners for the year 1927-1928, at page 6. Published January, 1929.

***Fifteenth Annual Report of the Electricity Commissioners for the year 1934-1935, at page 9. Published February, 1936.

authorized distributors of electricity, holders of franchises (through Parliamentary Orders) that are private companies. Apparently the Committee had not a much better opinion of these than of the Local Authorities probably for the reason that their chartered powers, their scope and the restricted type of business they do is not materially different from that of Local Authorities and all of these private companies suffer under the further disability of being subject to more or less imminent purchase by the local public authorities, a situation which naturally has not attracted capital or encouraged enterprise.

The third category consists of the "Power Companies" which connotes something quite different from the private companies conducting local electricity distribution undertakings. The Power Companies were originally chartered to do a bulk supply business and (although the distinction seems quaint in the light of modern practice) to supply power locally but not lighting save where power was also supplied. The early charters to local distributors gave exclusive rights, but for lighting only, and led to the use of continuous current systems which were ill adapted for the extensive supply of power and wholly unsuitable for bulk supply. Under the circumstances the Power Companies fulfilled a real necessity; they were chartered for extensive areas, naturally adopted the alternating-current system and in course of time procured rights for general local supply in areas not already preempted, either directly or through subsidiaries. The original bulk supply and power supply rights of Power Companies are in perpetuity but their acquired rights for general distribution are, like those of any other private distributors, subject to purchase by the local authorities.

These Power Companies are extensive geographically, have strong and competent staffs and management, and ample financial resources, according to the Report. Eighteen of them alone supply areas comprising 41 per cent of the total area and about 44 per cent of the total population of Great Britain. The organization, resources and management of these Power Companies apparently impressed the Committee favorably, but at the same time notice was taken of the principal weaknesses of the Power Companies' position, namely, their exclusion from the more densely populated urban areas and their insecure tenure of such rights as they have for general local supply. As to the fitness of the Power Companies as instrumentalities in the Committee's recommendations, the Report says:

"In the majority of cases it will no doubt be found that under an area scheme the Power Companies should be retained on a consolidated and improved basis . . ."

and at an earlier place in the Report:

". . . no scheme of reorganization will be complete which does not effect some substantial improvement in the conditions under which Power Companies are at present operating."

In addition to the three principal categories of authorized undertakers, two other types of organizations require mention. The first of these, the types of consolidations such as Joint Boards of two or more Local Authorities and Joint Electricity Authorities of a representative and elective character, are public bodies. They appear not to have commended themselves to the Committee as suitable instrumentalities in the Committee's recommendations, at least in their present forms. The second type comprises certain non-statutory undertakings, producers and suppliers of electricity which are not utilities. They apparently do a substantial part of the total business in competition with the statutory undertakings but are not subject to the obligations and responsibilities of the latter. Although not a major recommendation of the Committee, it is contemplated that they will be brought within the scope of the regulatory authorities.

### The Recommendations of the Report

The Committee's objective is to reorganize the physical and corporate organization for the distribution of electricity into simple, integral and in general larger units. The object of this procedure is to set up a smaller number of more efficient and progressive utilities having all of the functions appropriate for electricity distribution throughout relatively extensive areas. The Committee estimates that these measures will eliminate the past and existing adverse conditions which among other things include the local, almost parochial character of most distribution undertakings, overlapping boundaries, diverse systems and voltages, a prevailing lack of commercial initiative, inadequate financial resources and faulty rate structures, all of which has produced a condition described by an earlier committee as "chaotic" and which apparently has not been much improved since to judge from the tenor of the present report.

### *Consolidation of Undertakings*

The principal recommendations in the Report are those leading to a compulsory amalgamation of the smaller and conflicting undertakings into the most competent and vigorous undertaking in a suitable area, without regard to whether the absorbed undertakings or the nucleus of the consolidation are private or public organizations. These amalgamations are to be made according to schemes prepared by "District Commissioners," in effect deputies to the Electricity Commission; the Committee has gone as far as reasonably possible in recommending that these schemes shall be mandatory and that their execution shall be summary.

As already noted the Committee seems to have considerable respect for the capacity of the Power Companies to assume the role of the surviving consolidated undertaking but this is by no means a stated condition. The Committee also appears to have had in mind some criterion as to the sheer size of undertakings, at least to the extent that the process of amalgamation may be more summary in the case of undertakings having outputs of less than ten million kwhr per annum of which there are 448 out of a total of 635 undertakings. It does not appear, however, that the undertaking which had the largest output in a particular area would inevitably be chosen if another somewhat smaller had more of the other desirable qualifications.

The following quotations from the Report are applicable. The Committee recommended against a scheme for complete nationalization and announced as their principal recommendation:

"The retention and utilization, where possible, of the larger and more efficient of the existing undertakings (both public authorities and companies) and the absorption by such undertakings of the smaller and less efficient undertakings."

and:

"The essential objects of any such scheme must include:

"(1) A substantial reduction in the present number of undertakings by the substitution, where appropriate, of larger and more economic units.

"(2) The prevention of the splitting up of comprehensive undertakings in consequence of the exercise of rights of purchase by individual local authorities.

"(3) The elimination of duplicate powers wherever they exist in the same area."

and with special reference to Power Companies:

"We suggest that where appropriate, the basis of consolidation of the Power Com-

pany's undertaking should be on the following lines:

"(a) The amalgamation of the distribution undertakings (whether held by the Power Company or by a subsidiary or associated company), with the non-purchasable undertaking under the Power Acts.

"(b) The suspension of all existing local authority rights of purchase in respect of such distribution undertakings for some specified equated period.

"(c) The transfer to the Power Company of such of the other smaller undertakings in or adjacent to the Power Company's area, both local authority and company, as the District Commissioners consider necessary, having due regard, *inter alia*, to the consideration that the transfer of such undertakings to the Power Company will result in a general improvement in the area."

Since the carrying out of these plans for consolidation would involve the suspension of the well established rights of re-capture (as they would be called in American parlance) by local governmental authorities, many of these rights having matured and are now exercisable at 10-year intervals, a compensatory recommendation is made whereby the newly erected large undertakings shall be enfranchised for terms in no case greater than 50 years, after which they become purchasable by public authorities of a type suitable for the preservation of the consolidated property intact. Recommendaton is also made for the application of augmented regulatory control to these amalgamated undertakings.

It is contemplated that this regulatory control of these consolidated undertakings will consist principally, at least in the case of Power Companies, of (a) a sliding scale relating prices to profits, (b) approval of the terms of issue of new capital and (c) control of methods of charge (presumably the forms of tariffs) especially for domestic supply.

There appears to have been some uncertainty as to just what kind of a public authority might be suitable for the eventual taking over of the amalgamated undertakings. None of the present instrumentalities provided by existing law such as Joint Boards, Joint Authorities, etc., are unreservedly recommended by the Committee. In part, the reason for this may be in the magnitude of the proposed undertakings and the rather definite recommendations for the terms of purchase which provide compensation for capital expenditures (less depreciation), loss of profits and severance losses. Since the amounts of money would be large and the Committee obviously has considerable faith in the effectiveness of the proposed undertakings, it may be that, although the principle of ultimate recapture had to be preserved, the probability of its actual application was deemed to be so remote that it did not require very detailed consideration at this time.

Considerable attention is given in the Report to the terms of purchase for acquired undertakings and naturally this subject is extremely complex due to the provisions of early and later law. Briefly, the most interesting feature is the case of Local Authority undertakings acquired for amalgamation into other successor undertakings, whereof the Committee concludes that the basis should be payment for the fair value (cost less depreciation) of the physical assets, even although this may in some cases exceed the actual outstanding debt. On the other hand, and unlike the terms for private companies, no compensation is contemplated for loss of profits, or any intangible assets.

### *Methods of Charge*

The Report strongly advocates the provision of uniform tariffs over extensive areas to include light and heavy density districts, but the need for zoning, at least in the earlier phases of the new undertakings, is recognized as a legitimate possibility. It also recognizes that the attainment of this ideal will be advanced by the inclusion of highly diversified loads within a single system and area, indeed this is one of the reasons advanced for amalgamation.

The forms of tariffs are discussed at some length leading to a recommendation for a mandatory requirement that authorized distributors shall make available a two-part tariff for domestic supply, at least as an option. It is apparent that the Committee was impressed with the merits of the two-part or "all-in" form of tariff, and also that they had noted that lighting flat-rates may be and sometimes are depressed to unduly low levels. The main preoccupation of the Committee was with a form of rate that would have promotional effect, as shown by the following excerpts from the Report:

". . . an attractive two-part tariff is, particularly in the case of domestic supplies, the most effective means of bringing about a substantially extended use of the supply . . ."

"In the case of consumers whose use of electricity for lighting purposes is very small and who would obtain no advantage, on their existing consumption, in changing over to the two-part tariff, the standing charges alone involved in providing and maintaining the supply are such that a comparatively high flat rate is justified . . ."

"We are satisfied that it is more important to concentrate on offering a satisfactory two-part tariff, and that . . . the reduction of the lighting flat rate to an unduly low level is to be deprecated."

No other forms of tariffs are discussed. In particular the true promotional forms, as they are applied in America, are not mentioned. It is interesting to note, in view of developments in America, that after examining various possible bases for the fixed component of the two-part tariff, the Committee finally recommends that it should be based on floor area, or some suitable equivalent such as the ratable value of the premises.

### *Commercial Development*

The Committee also envisages, and recommends, provisions involving "favorable" schemes for the hire or hire-purchase of apparatus, assisted wiring and the provisions of adequate showrooms and good service to consumers. At one place the Report remarks, with disapproval:

"That out of 625 undertakings of which particulars were available, 153, including even certain large towns, had no showrooms . . . that 265 had no canvassing system at all, and that over 20 per cent had no scheme of assisted wiring . . ."

These commercial dispositions are clearly regarded as adjuncts to a suitable tariff so far as business development is concerned and illustrate again the purpose of the Committee to promote in every way a progressive and efficient business management.

### London

The great concentration of population and trade in London and its environs requires in nearly all inquiries like the present one that special consideration shall be given to the problems of this metropolitan district apart from the remainder of Great Britain. The McGowan Report, like other reports and legislation on electricity supply questions, deals separately with the London area, but in this case the Committee evidently had no reason to modify their principal recommendations which are applied to London with an additional recommendation that the Metropolitan District shall constitute one of the Administrative Districts which are proposed to be set up for the purpose of carrying the Committee's recommendations into effect.

The Report notes, however, that the developments of the past few years, under existing law, have accomplished a certain approach to the amalgamation

(*Continued on page 330*)

# Personnel of E.E.I. Committees for 1936-1937

COMMITTEE organization for the current administrative year has been practically completed, and committee work is well under way. The several engineering committees plan to meet in October. Other committees will also hold meetings during the early Fall. Committee members will be notified of the time and place of meetings.

Acceptances to appointments on the Institute Committees have been coming in rapidly. With the exception of the Accounting and the Statistical Committees and a few appointments to other committees to be announced later, the personnel of the several committees for 1936-1937 is as follows:

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### ACCIDENT PREVENTION COMMITTEE

*Chairman,* W. A. BUCHANAN, Appalachian Electric Power Co., Welch, W. Va.

C. R. BEARDSLEY, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

A. S. BENNION, Utah Power & Light Co., Salt Lake City, Utah.

H. J. BURTON, Consumers Power Co., Jackson, Mich.

GEORGE S. DIEHL, Pennsylvania Water & Power Co., Baltimore, Md.

J. D. ELLIS, Northwestern Electric Co., Portland, Ore.

I. W. GROSS, American Gas & Electric Co., New York, N. Y.

ROY M. GODWIN, Philadelphia Electric Co., Philadelphia, Pa.

E. W. GORRY, The New York Edison Co., Inc., New York, N. Y.

E. R. KROPP, Union Electric Light & Power Co., St. Louis, Mo.

WILLS MACLACHLAN, 50 Oakwood Avenue, Toronto, Canada.

C. N. RAKESTRAW, The Cleveland Electric Illuminating Co., Cleveland, Ohio.

C. J. RUTLAND, Texas Power & Light Co., Dallas, Tex.

W. R. SMITH, The United Engineers & Constructors, Inc., Newark, N. J.

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### ELECTRICAL EQUIPMENT COMMITTEE

*Chairman,* J. F. FAIRMAN, Brooklyn Edison Co., Inc., Brooklyn, N. Y.

R. N. CONWELL, Public Service Electric & Gas Co., Newark, N. J.

S. M. DEAN, The Detroit Edison Co., Detroit, Mich.

H. W. EALES, Byllesby Engineering & Management Corp., Chicago, Ill.

E. S. FIELDS, The Union Gas & Electric Co., Cincinnati, Ohio.

H. S. FITCH, West Penn Power Co., Pittsburgh, Pa.

E. S. FITZ, Virginia Electric & Power Co., Richmond, Va.

J. H. FOOTE, The Commonwealth & Southern Corp., Jackson, Mich.

W. E. GUNDLACH, The Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

R. A. HENTZ, Philadelphia Electric Co., Philadelphia, Pa.

CHASE HUTCHINSON, Tennessee Public Service Co., Knoxville, Tenn.

F. A. LANE, American Gas & Electric Co., New York, N. Y.

S. J. LISBERGER, Pacific Gas & Electric Co., San Francisco, Cal.

R. T. HENRY, Buffalo, Niagara & Eastern Power Corp., Buffalo, N. Y.

H. S. PATTON, Public Service Co. of Indiana, Indianapolis, Ind.

G. E. QUINAN, Puget Sound Power & Light Co., Seattle, Wash.

H. J. SCHOLZ, The Commonwealth & Southern Corp., Birmingham, Ala.

WILLIAM SHULER, The Dayton Power & Light Co., Dayton, Ohio.

A. E. SILVER, Ebasco Services Incorporated, New York, N. Y.

W. F. SIMS, Commonwealth Edison Co., Chicago, Ill.

L. M. SMITH, Alabama Power Co., Birmingham, Ala.

PHILIP SPORN, American Gas & Electric Co., New York, N. Y.

STANLEY STOKES, Union Electric Light & Power Co., St. Louis, Mo.

GEORGE SUTHERLAND, New York & Queens Electric Light & Power Co., Flushing, N. Y.

A. H. SWEETNAM, The Edison Electric Illuminating Co., Boston, Mass.

B. VAN NESS, JR., Pennsylvania Water & Power Co., Baltimore, Md.

H. L. WALLAU, The Cleveland Electric Illuminating Co., Cleveland, Ohio.

R. W. WILBRAHAM, United Engineers & Constructors, Inc., Philadelphia, Pa.

H. B. WOOD, Stone & Webster Engineering Corp., Boston, Mass.

F. D. WYATT, The United Light & Power Engineering & Construction Co., Davenport, Iowa.

E. C. WILLIAMS, Public Service Co. of Northern Illinois, Chicago, Ill.

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### HYDRAULIC POWER COMMITTEE

*Chairman,* C. F. MERRIAM, Pennsylvania Water & Power Co., Baltimore, Md.

R. E. ARGERSINGER, Stone & Webster Engineering Corp., Boston, Mass.

A. C. CROGHER, Ebasco Services Incorporated, New York, N. Y.

E. H. COLLINS, The Washington Water Power Co., Spokane, Wash.

ALBION DAVIS, Union Electric Light & Power Co., St. Louis, Mo.

W. P. HAMMOND, Georgia Power Co., Atlanta, Ga.

A. H. MARKWART, Pacific Gas & Electric Co., San Francisco, Cal.

E. L. PETERSON, American Gas & Electric Co., New York, N. Y.

H. G. ROBY, Byllesby Engineering & Management Corp., Chicago, Ill.

E. B. STROWGER, Buffalo, Niagara & Eastern Power Corp., Buffalo, N. Y.

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### INSURANCE COMMITTEE

*Chairman,* J. H. NICKELL, Philadelphia Electric Co., Philadelphia, Pa.

I. M. CARPENTER, Ebasco Services Incorporated, New York, N. Y.

F. H. DECKMAN, Columbia Corp., Columbus, Ohio.

EDWARD P. DURFEE, Consolidated Edison Company of New York, Inc., New York, N. Y.

REGINALD FLEMING, The Commonwealth & Southern Corp., New York, N. Y.

HARRY P. HOOD, The Edison Electric Illuminating Co., Boston, Mass.

WILLS MACLACHLAN, 50 Oakwood Avenue, Toronto, Canada.

A. W. REID, American Gas & Electric Co., New York, N. Y.

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### PRIME MOVERS COMMITTEE

*Chairman,* PAUL W. THOMPSON, The Detroit Edison Co., Detroit, Mich.

W. H. ALDRICH, The Cleveland Electric Illuminating Co., Cleveland, Ohio.

C. C. BALTZLY, Philadelphia Electric Co., Philadelphia, Pa.

D. S. BROWN, The Union Gas & Electric Co., Cincinnati, Ohio.

W. E. CALDWELL, The New York Edison Co., Inc., New York, N. Y.

WALKER CISLER, Public Service Electric & Gas Co., Newark, N. J.
F. S. CLARK, Stone & Webster Engineering Corp., Boston, Mass.
H. M. CUSHING, Buffalo General Electric Co., Buffalo, N. Y.
G. C. DANIELS, The Commonwealth & Southern Corp., Jackson, Mich.
F. L. DORNBROOK, The Milwaukee Electric Railway & Light Co., Milwaukee, Wis.
JOHN M. DRABELLE, Iowa Electric Light & Power Co., Cedar Rapids, Iowa.
W. C. DRUMMOND, Byllesby Engineering & Management Corp., Chicago, Ill.
LOUIS ELLIOTT, Ebasco Services Incorporated, New York, N. Y.
C. H. FELLOWS, The Detroit Edison Co., Detroit, Mich.
A. E. GRUNERT, Commonwealth Edison Co., Chicago, Ill.
E. L. HOPPING, Philadelphia Electric Co., Philadelphia, Pa.
ALFRED IDDLES, United Engineers & Constructors, Inc., Philadelphia, Pa.
E. T. KECK, Texas Power & Light Co., Dallas, Tex.
J. A. KEETH, Kansas City Power & Light Co., Kansas City, Mo.
E. H. KRIEG, American Gas & Electric Co., New York, N. Y.
J. N. LANDIS, Brooklyn Edison Co., Inc., Brooklyn, N. Y.
J. M. LEE, Public Service Co. of Northern Illinois, Chicago, Ill.
J. W. MACKENZIE, Consumers Power Co., Jackson, Mich.
H. C. MILLER, Public Service Electric & Gas Co., Irvington, N. J.
JAMES MUIR, American Water Works & Electric Co., Inc., New York, N. Y.
A. L. PENNIMAN, JR., Consolidated Gas, Electric Light & Power Co., Baltimore, Md.
R. C. POWELL, Pacific Gas & Electric Co., San Francisco, Cal.
E. B. RICKETTS, The New York Edison Co., Inc., New York, N. Y.
G. T. SHOEMAKER, The United Light & Power Engineering & Construction Co., Kansas City, Mo.
M. F. STACK, Ebasco Services Incorporated, New York, N. Y.
E. H. TENNEY, Union Electric Light & Power Co., St. Louis, Mo.
FRANK UMBEHOCKER, Chicago District Electric Generating Co., Hammond, Ind.

## PRIZE AWARDS COMMITTEE

*Chairman,* FRANK W. SMITH, The New York Edison Co., Inc., New York, N. Y.
*Secretary,* M. T. CHANDLER, The New York Edison Co., Inc., New York, N. Y.
J. E. DAVIDSON, Nebraska Power Co., Omaha, Neb.
C. W. KELLOGG, Engineers Public Service Co., New York, N. Y.

## RATE RESEARCH COMMITTEE

*Chairman,* F. A. NEWTON, The Commonwealth & Southern Corp., New York, N. Y.
H. H. AGEE, Public Service Electric & Gas Co., Newark, N. J.
B. B. BECKETT, Pacific Gas & Electric Co., San Francisco, Cal.
R. D. CUTLER, The Hartford Electric Light Co., Hartford, Conn.
J. T. KIMBALL, Niagara Hudson Power Corp., Buffalo, N. Y.
L. R. LEFFERSON, Ebasco Services Incorporated, New York, N. Y.
C. E. NEIL, The Cleveland Electric Illuminating Co. (60 Broadway), New York, N. Y.
H. H. PLANK, The United Gas Improvement Co., Philadelphia, Pa.
E. N. STRAIT, Byllesby Engineering & Management Corp., Chicago, Ill.

## SALES COMMITTEE

*Chairman,* DAVIS M. DEBARD, Stone & Webster Service Corp., New York, N. Y.
P. M. ALDEN, Philadelphia Electric Co., Philadelphia, Pa.
JOSEPH F. BECKER, The New York Edison Co., Inc., New York, N. Y.
A. A. BROWN, Oklahoma Gas & Electric Co., Oklahoma City, Okla.
C. A. COLLIER, Georgia Power Co., Atlanta, Ga.
R. D. CUTLER, The Hartford Electric Light Co., Hartford, Conn.
J. DANIELS, The Edison Electric Illuminating Co., Boston, Mass.
J. E. DAVIDSON, Nebraska Power Co., Omaha, Neb.
R. E. FISHER, Pacific Gas & Electric Co., San Francisco, Cal.
MISS FLORENCE FREER, Brooklyn Edison Co., Inc., Brooklyn, N. Y.
C. L. HAROLD, Brooklyn Edison Co., Inc., Brooklyn, N. Y.
W. H. HODGE, Byllesby Engineering & Management Corp., Chicago, Ill.
E. W. LLOYD, Commonwealth Edison Co., Chicago, Ill.
C. E. MICHEL, Union Electric Light & Power Co., St. Louis, Mo.
A. C. MCMICKEN, Portland General Electric Co., Portland, Ore.
JOHN D. NOYES, The Detroit Edison Co., Detroit, Mich.
P. H. POWERS, West Penn Power Co., Pittsburgh, Pa.
L. F. RIEGEL, Gulf States Utilities Co., Beaumont, Tex.
K. M. ROBINSON, Idaho Power Co., Boise, Idaho.
W. H. SAMMIS, The Commonwealth & Southern Corp., New York, N. Y.
M. E. SKINNER, Niagara Hudson Power Corp., Buffalo, N. Y.
H. F. SMIDDY, Ebasco Services Incorporated, New York, N. Y.
H. P. J. STEINMETZ, Public Service Electric & Gas Co., Newark, N. J.
R. H. TILLMAN, Consolidated Gas Electric Light & Power Co., Baltimore, Md.
M. N. WATERMAN, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.
H. C. WEBB, JR., Virginia Electric & Power Co., Richmond, Va.
GEORGE E. WHITWELL, Philadelphia Electric Co., Philadelphia, Pa.
H. E. YOUNG, Northern States Power Co., Minneapolis, Minn.

## TRANSMISSION AND DISTRIBUTION COMMITTEE

*Chairman,* P. H. CHASE, Philadelphia Electric Co., Philadelphia, Pa.
G. W. BEAN, Texas Electric Service Co., Fort Worth, Texas.
E. S. BUNDY, Buffalo Niagara & Eastern Power Corp., Buffalo, N. Y.
D. M. BUNN, Northern States Power Co., Minneapolis, Minn.
C. C. CORNELIUS, Kansas City Power & Light Co., Kansas City, Mo.
R. R. COWLES, Pacific Gas and Electric Co., San Francisco, Cal.
M. T. CRAWFORD, Puget Sound Power & Light Co., Seattle, Wash.
W. F. DAVIDSON, Brooklyn Edison Co., Inc., Brooklyn, N. Y.
MERRILL DEMERIT, West Penn Power Co., Pittsburgh, Pa.
C. A. DOUGHERTY, Penn Central Light & Power Co., Altoona, Pa.
MARK ELDREDGE, Memphis Power & Light Co., Memphis, Tenn.
H. A. ENOS, American Gas & Electric Co., New York, N. Y.
G. H. FIEDLER, Rochester Gas and Electric Corp., Rochester, N. Y.
W. E. GUNDLACH, The Milwaukee Electric Railway & Light Co., Milwaukee, Wis.
T. H. HAINES, The Edison Electric Illuminating Co., Boston, Mass.

EDWIN HANSSON, Pennsylvania Water & Power Co., Baltimore, Md.
J. P. JOLLYMAN, Pacific Gas and Electric Co., San Francisco, Cal.
W. G. KELLEY, Commonwealth Edison Co., Chicago, Ill.
W. H. KNUTZ, Northern Indiana Public Service Co., Hammond, Ind.
A. K. MACNAUGHTON, The Commonwealth & Southern Corp., Birmingham, Ala.
W. F. NIMMO, Virginia Electric & Power Co., Richmond, Va.
E. W. OESTERREICH, Duquesne Light Co., Pittsburgh, Pa.
J. J. POKORNY, The Cleveland Electric Illuminating Co., Cleveland, Ohio.
T. A. PURTON, Idaho Power Co., Boise, Idaho.
E. V. SAYLES, The Commonwealth & Southern Corp., Jackson, Mich.
H. R. SEARING, The New York Edison Co., Inc., New York, N. Y.
H. P. SEELYE, The Detroit Edison Co., Detroit, Mich.
A. E. SILVER, Ebasco Services, Incorporated, New York, N. Y.
C. T. SINCLAIR, Byllesby Engineering & Management Corp., Pittsburgh, Pa.
L. G. SMITH, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.
NICHOLAS STAHL, Pennsylvania Power & Light Co., Allentown, Pa.
P. B. STEWART, The Union Gas & Electric Co., Cincinnati, Ohio.
STANLEY STOKES, Union Electric Light & Power Co., St. Louis, Mo.
R. O. SUTHERLAND, The United Light & Power Engineering & Construction Co., Kansas City, Mo.
G. S. VAN ANTWERP, Philadelphia Electric Co., Philadelphia, Pa.
C. V. WADDINGTON, Kansas Gas & Electric Co., Wichita, Kan.
J. S. WARE, Public Service Electric & Gas Co., Newark, N. J.

## The McGowan Report

(*Continued from page 327*)

which is the central recommendation of the Committee.

### Holding Companies

In compliance with the instruction in its terms of reference, the Committee takes cognizance of holding companies which it notes have "become a common type of financial structure in the industry." After examining, pro and con, the characteristic features of holding companies, both the features and the arguments being thoroughly familiar to American readers, the Report makes the following observation:

"As a result of our consideration of the statistics and other evidence placed before us, we are satisfied that most of the Holding Company groups operating in the Industry have operated efficiently and have done good work in extending facilities for the use of electricity in the areas they control. There are, however, potentialities of abuse in this form of structure which have given rise to uneasiness in the minds of consumers and the public."

After further consideration of specific criticisms having to do mainly with potential rather than actual situations and with particular reference to the cases of physically contiguous or non-contiguous operating subsidiaries, the Committee suggests that their recommendations for the amalgamation of contiguous undertakings will automatically dispose of the majority of such cases; that is to say, the holding company will find itself with but a single consolidated operating subsidiary. With respect to the holding companies themselves, the Committee recommends that their accounts shall be subject to the same official audit as that of authorized undertakers.

It appears to be a reasonable inference from the discussion in the Report that the Committee was at least as much concerned with the problems involved in the geographical distribution of operating subsidiaries and their adaptability to area amalgamations, as they were with the alleged abuses of the holding companies.

The Report also deals with several other matters such as "rates" or local taxes—a very complex subject in Great Britain, contractor relations where the situation and the representations of the contractors are similar to those in America, employee relations with reference to the possible displacement of personnel as a result of the economies of amalgamation, and the perennial question of standardization of systems and voltages. With regard to the latter the Committee noticed that an extensive standardization of frequency was in progress under the auspices of the Central Electricity Board (upon which £16,018,786 has been expended up to the end of 1935) and recommended against a comparable project requiring the use of public funds. The Committee suggests that the effect of the recommended amalagamations, with official encouragement, will be to expedite the process of standardization.

## Administration Committee, World Power Conference

E. C. HUTCHINSON, chairman of the New York Committee for the Third World Power Conference, to be held in Washington, September 7 to 12, has announced the appointment of an Administration Committee to serve virtually as an executive committee of the larger committee. The large committee, the personnel of which was announced earlier, consists of fifty-four leading engineers in the metropolitan district.

The Administration Committee is as follows:

*Reception*—R. M. GATES, Vice-President, Combustion Engineering Corporation.

*Transportation*—E. C. M. STAHL, Operating Superintendent, Brooklyn Edison Company.

*Hotels & Local Services*—C. L. LAW, Executive Assistant to the president, Consolidated Edison Company.

*Headquarters & Registration*—JOHN L. LAWRENCE, Engineer for Receiver of the Interborough Rapid Transit Company.

*New York Technical Tours*—O. B. BLACKWELL, Vice-President, American Institute of Electrical Engineers.

*Women's Activities*—DR. LILLIAN M. GILBRETH, Consulting Management Engineer, Honorary Chairman.

MRS. ROY V. WRIGHT, President, Engineering Woman's Club, Chairman.

MRS. GEORGE W. FARNY, Past President, Engineering Woman's Club, Chairman, Executive Committee.

This Committee will be in charge of all activities for that portion of the 700 official delegates to the Conference, representing some thirty foreign countries, who will pass through the Port of New York en route to Washington, beginning about the middle of August. Special meetings, dinners, and tours of inspection are being arranged for the delegates while they are in the city.

*Byllesby Prize Paper*

# The Accounting Future in the Electric Public Utility Industry

## Under the "Public Utility Act of 1935" and Other "New Deal" Laws

By H. D. Anderson

WHAT can be of greater interest at this time to public utility accountants than the "Public Utility Act of 1935" and the possibilities it holds for profound changes in accounting procedure?

These changes may well be of a character that would be of great benefit to the industry, its customers and its security holders, but if changes in accounting procedure should be dictated by individual accountants who are at heart strong believers in Government Ownership of Utilities, and whose radical tendencies have led them in the past to exhibit an almost fanatical distrust of everything and everyone connected with the industry, then irreparable damage and injustice may result.

Let us as accountants hope that the Commissions in charge of administering the terms of the "Public Utility Holding Company Act of 1935" and of the "Federal Power Act" may see to it, through exercise of the broad powers given them under the Act, that their accountants offer constructive criticism, that they adhere to sound accounting principles, that they offer to confer with the industry's accountants regarding proposed changes and that they do not attempt to regulate the industry through accounting procedure, but rather let that important function rest in the hands of the various Commissions, Federal and State where the law says it belongs.

The thought of proposed changes in accounting procedure as affecting the Public Utility industry leads at once to consideration of the place where such changes must originate.

This place of origin will naturally be in the "Accounting Bible" for the industry, that is to say in the "Uniform Classification of Accounts."

It has been stated that over 90 per cent of the electric public utility companies of the country will be affected by the legislation enacted by the 74th Congress in the form of the "Public Utility Act of 1935" including Part III, Title II, of the act which Regulates Electric Companies engaged in Interstate Commerce.

MR. ANDERSON

*Mr. Anderson is the winner of the 1936 First Byllesby Award. He also won First Award in the same contest in 1931.*

*Mr. Anderson has been employed in the electric light and power industry for approximately thirty years. His first work was with the East Liverpool (Ohio) Traction and Light Company in 1906. Later he served as Assistant Secretary and Assistant Treasurer of the National Properties Company, 1912 to 1916, following which he was elected Assistant Comptroller of The American Railways Company, later known as the American Electric Power Company. In 1925 he was promoted to Comptroller and Assistant Secretary and Assistant Treasurer. Control of that company was acquired by the American Gas and Electric Company during 1924, and since 1926, Mr. Anderson has been located in their New York office and has served in the capacity of Assistant Secretary and Assistant Treasurer.*

### Broad Powers Vested in Federal Commission

A close study of the law will develop the fact that the two Federal Commissions are given practically unlimited power over the accounting practice of all electric public utility companies subject to the Act. It is of interest to note that this power over accounting practice is by no means confined to the electric public utility business. It would seem that by virtue of Section 15 (b) this power may be asserted against companies and even against individuals should they own as little as 5 per cent of the voting securities of a registered holding company or of other companies subject to the Act.

By virtue of Section 15 (d) it would seem that the power of the Commission to govern accounting practice and to provide a uniform system of accounts extends to individuals and companies not engaged in the electric public utility business and not necessarily even owning any securities of electric public utility companies if said individuals or companies should happen to do the principal part of their business with public utility companies. This section could apply to manufacturers, public accounting firms, lawyers, general contractors and many others who, although seeking business from all, happened to do most of their business with public utility companies.

Particular attention is also called to the provisions of Section 15 (e). Literally interpreted, this seems to say to the public utility accountant that after he has complied with every requirement of the Commission as to the form and manner of keeping the accounts that it is "unlawful" for him to keep any *additional* record of any kind without getting consent of the Commission. In the case of a large business it is very difficult for the accountant in charge to know what records, memoranda, etc., his subordinates keep in order to enable them to give prompt answers to questions asked of them.

The law has been enacted and unless it is repealed, amended or declared unconstitutional or otherwise rescinded it is the duty of the utility accountant to meet its requirements faithfully even

though he may not approve of many of them. Such companies as have entered the courts and asked for a judicial determination of the constitutionality of the law will have to make their own decision as to what extent they will instruct their accountants to follow the provisions of the law in respect of accounting requirements pending said judicial determination.

The law certainly serves to put all electric public utility accountants on notice to make a serious study of the accounting practices of their respective companies and to be prepared to offer from their years of experience in the business such suggestions as may be constructive and also be prepared to offer convincing arguments as to why certain revolutionary accounting ideas which have been recently advanced by certain accountants should not be adopted by regulatory bodies either State or Federal.

Section 15 of Title I of the Public Utility Act of 1935 appears to vest in the Securities and Exchange Commission the power to require all registered holding companies, their subsidiaries, affiliates and all mutual service companies and their affiliates and all persons whose principal business is the performance of service, sales or construction contracts for a public utility or a holding company to make and keep records in a "form and manner" to be prescribed by the Commission.

It also gives the Commission the power to determine the preservation period of all such records and accounts and gives it the right to prescribe "uniform methods" for all companies and persons subject to the Act. It also grants the Commission access to and inspection of all records, accounts, etc.

Section 301 of Title II, Part III, grants very much the same powers to the Federal Power Commission as to companies subject to the Title. It grants Federal Power Commission the right to prescribe a "system of accounts" for each class of "licensees and public utilities" subject to the Title. The companies subject to the Act are, however, not relieved from keeping such records as may be required by State laws to which they are subject.

It seems appropriate at this point to mention that Section 318 of Title II, Part III, provides that if companies are subject to both the requirements of Title I and of Title II as to any "subject matter" (this includes the "method of keeping accounts") then the requirements of Title I administered by Securities and Exchange Commission shall prevail unless the Commission has granted exemption to the person or company affected by the requirements of Title I.

### Possible Multiplicity of Systems

From the foregoing it becomes apparent that the majority of electric public utility companies in the country may be faced with three "Uniform System of Accounts," one by the Securities and Exchange Commission, one by Federal Power Commission and one by a State Commission, although Section 318 might eliminate one of these three.

Certain short line railroads which are subsidiaries of electric public utilities would also be required to follow the Interstate Commerce Commission classification.

In view of this situation, it is only reasonable to suppose that Securities and Exchange Commission, Federal Power Commission and the several State Commissions would attempt to reach an agreement as to a standard uniform system of accounts.

The meeting held in Washington on December 3, 1935, attended by representatives of most of these Commissions, may have been an initial step in this direction, although at this time (December 27, 1935) there has been no public announcement made as to the results of the meeting. The accountants of the electric public utility industry should approve the efforts of the Commissions to arrive at a uniform standard system of accounts, but it seems only right, fair and logical that the industry should be represented by its accountants, at all conferences where such a standard is being developed. In general, their years of daily contact with the problems of the industry place them in a position to be of invaluable assistance in the preparation of such a standard. It would be a narrow view indeed to consider that the industry's accountants as a body hold such a prejudice against regulatory measures as to prevent their intelligent cooperation with commission accountants in the development and working out of such an important subject as a uniform classification of accounts for use by the entire industry. The fact that, if these laws are held valid, the Commissions have the final word should not be overlooked and therefore the Commissions would be in position to take advantage of the constructive suggestions offered by the accountants of the industry and reject those which they felt were not in order. In other words, the Commissions seem to have everything to gain and nothing to lose by consultation with the industry's accountants.

### Can the Commission Radically Change Accepted Accounting Definitions?

It is not the purpose of this paper to pass upon the legal significance of the sections granting the Commissions the power to prescribe accounting methods; that must be left with the legal profession and the courts, but to the lay mind at least it would seem that these sections dealing with accounts and records grant powers as to "form and manner," as to preservation of records and as to inspection of records and that they do not grant powers to write into accounting classifications new definitions not in accord with existing law as to "cost" and as to "profit and loss" and other vital factors having to do with the recordation of the financial history of a corporation.

The foregoing paragraph is not intended to convey the impression that it is the writer's opinion that the various Commissions, State and Federal, will generally promulgate an accounting classification containing such fallacies which must of necessity be made the subject of court action, but is mentioned for two reasons:

ONE—At the present time two new accounting classifications, one Federal and one State, do contain such points and are being contested in the courts.

TWO—At the annual meeting of the National Association of Railroad and Utility Commissioners held in November of 1935, a new proposed "Uniform System of Accounts for Electric Utilities" was presented for adoption and this proposed classification does contain, in the writer's opinion, requirements which have no support at law and which would force on the accounting companies false theories of accounting which would improperly and unfairly reflect the financial history of the companies. These false accounting theories reflected in the published statements of the accounting company would in many cases affect its credit, render it difficult for the company to raise funds to meet the cost of expansion and development and might ultimately lead to its insolvency through no fault of the management of the business.

### Features of a Proposed Standard Classification of Accounts Now Before the National Association of Railroad and Utility Commissioners

Electric public utility accountants should give their attention at this time to features in the proposed classification submitted to the National Association of Railroad and Utility Commissioners for approval, which may be considered as

departures from normal procedure and which the accounting profession generally would probably consider quite wrong in principle.

Outstanding among these features are:

1—Fixed Capital Accounting
2—Depreciation Accounting
3—Exclusion of certain items as operating expenses
4—Recordation of fixed capital and operating expenses by "plants" and by cities, villages and towns.

Sound accounting theory has always demanded that a system of accounts should properly reflect the investment in the business and record the earnings on said investment, but the proposed classification by means of accounting rules attempts to settle questions which should be decided by the Commissions themselves and a close reading of it leads one to believe that it was written more as a medium for controlling rates than for what should be its primary purpose, namely, the proper recording of the financial history of the corporation using it.

The thought just expressed is probably brought out most clearly in the proposals regarding fixed capital accounting. To date there have been two theories regarding the determination of a rate base in the public utility business.

ONE—The "Prudent Investment" theory.
TWO—The "Reproduction Cost—less depreciation" theory.

Since the Supreme Court case of Smythe vs. Ames the second method has been generally accepted, but this proposed new classification by the mere use of accounting rules and regulations seems to propose an entirely new theory —for want of a better name it might be called the "Investment Made by Others" theory. The proposed classification appears to contemplate that the utility company shall within 18 months after the Classification becomes effective rewrite all of its fixed capital accounts on the basis of the cost of property at the time it was first devoted to public use, regardless of by whom owned at the time and regardless of what amount the accounting utility may have paid for said property. Little need be said regarding this proposal as it appears to be a contravention of existing law and consequently exceeds the statutory powers of existing Commissions, at least this seems to the writer to be the situation, although again it is a matter of law for the courts to decide. Departing from the legal aspects and confining the thought to Accounting only (which is what this paper should do) it becomes apparent that the proposed theory violates sound accounting principles when it proposes that a corporation be forced to record losses or profits which it never suffered or made as the case may be.

The classification will have the effect of increasing net income available for return on a rate base by excluding from operating expenses such items as "Debt Service Expense," "Financial Administration Expense" and "Income Taxes." Accountants, Commissions and Courts have heretofore considered these items as proper items to be included in arriving at the cost of rendering service.

The proposed classification also takes an inflexible view of the very debatable subject of depreciation. It specifies the "straight line" method. When one stops to think of the volumes that have been written on this important subject and when the radically different opinions of equally able accountants not connected with the industry are considered, it is a bit surprising that those who prepared the proposed classification should so definitely settle the matter on a "straight line" basis. The term depreciation covers much more than "wear and tear" due to usage. It includes obsolescence, inadequacy and other factors. Depreciation may be physical or it may be functional.

The writer has for many years past been of the opinion that "physical depreciation" and "functional depreciation" are so entirely different in their nature that they should be made the subject of separate accounts and reserves. Physical depreciation might be dealt with on a purely mathematical basis, but functional depreciation involving improvement in the art, growth of business, governmental requirements, etc., is an entirely different matter no more related to "wear and tear" than maintenance of meters is related to the cost of fuel.

The proposed classification is either dealing with physical depreciation alone when it proposes mathematical or actuarial procedure, based on useful life of property, or else those preparing the classification must claim the ability to predict the growth of business and property and the rate and nature of the improvement which may take place in the art of the production, transmission, distribution, etc., of electric energy.

The industry's accountants might well consider the proposal in the classification to record fixed capital and operating expenses by "each separate generating station, substation, transformer station and transmission line, and the distribution and utilization system in each city, village or town" and form some definite idea as to what the advantage of such procedure as to their particular company might be as compared with the greatly increased cost of such a program.

It is to be remembered that in the final analysis increased costs forced on an electric public utility company through requirements of an elaborate accounting system, even if said requirements may be unreasonable or unnecessary, must be borne by the consumer.

It is also apparent that it will be extremely difficult if not impossible for anyone (except as to broad general principles) to prepare a classification of accounts that can be successfully used as a national standard, and for this reason it would seem advisable to have any such proposed classification sufficiently flexible in its requirements to permit the various Commissions to use their own judgment to a great extent in its administration.

### How May Accountants Construe the Wording "Any Material Fact"?

All accountants, both private and public, may well give serious consideration to the matter of their personal liability as set forth in some of these new federal laws.

There have been quoted heretofore herein certain sections of the law having to do with this matter of liability. Particular attention is called to the words "false or misleading with respect to any material fact."

Certainly it is true that, generally speaking, accountants have not followed the practice of preparing, publishing or certifying false or misleading statements.

There may have been certain instances where either through ignorance or deliberately, such statements were so prepared, published or certified, but such instances were the exception and not the rule and it seems reasonable to assume that the market collapse of 1929, coupled with the thorough investigation of the electric public utility industry which has been made since 1929 have brought to light all such instances.

It is not the purpose of this paper to presume to define what does or does not constitute a "material fact" but it seems apparent that accountants must give the utmost care and thought in the preparation or certification of financial statements. Ordinary care and precau-

tion will not be enough. Extraordinary thought will be required.

**May the New Laws Force a Change in the Utilities' Contracts With Users of Large Amounts of Electric Energy?**

As a case in point this matter of "material fact" may force a change in the terms and conditions of contracts under which the electric public utility industry has sold much of its output. This refers to term contracts of say from three to ten years which contain a provision for a "minimum," "demand," "capacity" or "fixed" charge as it is sometimes variously called. This type of contract is usually made with large users of electric energy such as large industrial or manufacturing companies. The theory of this "capacity" charge is that the selling company has been forced to invest capital in plant and equipment on account of the buying company and that the buying company must pay a minimum charge sufficient in amount to cover the cost to the selling company of the maintenance, depreciation, etc., plus a return on its investment made in behalf of the buying company. The second element of these contracts is the energy charge under which the buying company pays a specified rate per kwhr for the energy actually used. The buying company has entered into a legally enforceable contract calling for the payment of a fixed sum of money over a period of years. This sum of money is not necessarily a charge against future operations, for it must be paid even though the buying company does not operate at all. It must be paid even though the buying company liquidates. It must be paid even if the buying company sells its business to a competitor in some other part of the country who would no longer operate the plant of the former company. That is to say, the amount is an actual, not a contingent, liability, and must be paid by the obligor to whatever extent said obligor has assets to meet its liabilities. In order to clarify the foregoing reasoning, let us suppose that a manufacturing company has entered into a five-year contract with an electric public utility company for the purchase of electric energy and that the "capacity" charge referred to amounts to $200,000.00 per annum and that the language of the contract is to the effect that this $200,000.00 payment is to protect the utility company on its investment made on account of the manufacturing company, but in which the manufacturing company has no title. Should not the manufacturing company at once set up a liability of $1,000,000.00 on its books? If the contract were for 10 years, the liability would be $2,000,000.00.

It would certainly seem that the written agreement of a company to unconditionally pay $1,000,000.00 over a period of five years constituted a material fact, but the writer (although it may have been done) has never heard of a case where such a matter was so recorded. The customary way has been to consider the $200,000.00 plus any amount actually paid during the year for energy taken as the buying company's "power bill" and chargeable to the year's operating expenses even though the $200,000.00 appears to be a payment to be made to the utility company *not for service necessarily,* but for the *readiness and ability to serve.* I have never heard of a utility company setting up on its books the $1,000,000.00 asset it has by virtue of the foregoing supposed contract. Should not the asset be reflected and written down by the annual payments made by the buyer?

It may be admitted that the setting up of the amount on the books of the utility is less important than the recording of the liability by the buying company because the utility has set up the cost of the property to which the $1,000,000.00 payment applies.

In the case of the buying company there is nothing on the asset side of its balance sheet to offset its $1,000,000.00 liability. It is true that the buying company has an intangible asset in the form of an assured source of power which *presumably* it will need and use in its business.

Sometimes these contracts contain cancellation clauses, but even so it would seem that sound accounting practice would require the recordation of such liability as might exist from the execution of the contract to the date of permitted cancellation.

Also when cancellation clauses are contained in such contracts, they seem to tend to destroy the theory on which the contract was made, namely, that the selling company must be amply protected on account of the investment in plant which it has made exclusively on account of the buying company.

If companies coming under the jurisdiction of the Securities and Exchange Act of 1934 should be required to record as liabilities items similar to the $1,000,000.00 items just discussed, it would seem that they would soon demand some new form of contract under which they might buy their electric energy without having to record large sums on their balance sheet as liabilities.

Would a long term lease of an office building or other property be considered a "material fact" and the liability required to be set up on the balance sheet? Would a contract for employment or services for more than one year be required to be shown? Would the fact that a particular company might be incurring liability by the fact of its contesting in the courts existing laws be deemed a "material fact" that should be shown in some form in all statements filed in respect of Title I of the Public Utility Act of 1935 and in respect of the Securities and Exchange Act?

Is the option held by the United States Government under the Federal Water Power Act to purchase property of a licensee a "material fact" that should be shown on the statements of electric public utility licensees?

Careful thought and study may bring to light a number of conditions similar to the foregoing which are reasons why accountants who have spent their entire business lives dealing with problems of the electric public utility industry should have the opportunity of consulting with Commissions' Accountants in the preparation of accounting rules and regulations designed to govern the entire industry. It is the writer's opinion that intelligent cooperation can and will solve the problem.

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## Uniform System of Accounts Prepared By E. E. I.

A DRAFT of a proposed revision of the Uniform Classification of Accounts for Electric Utilities has been prepared by the Accounting Committee of the Edison Electric Institute. The draft was undertaken after the committee had prepared extensive comments, suggestions and recommendations on a proposed Uniform System of Accounts prepared by the Committee on Statistics and Accounts of the National Association of Railroad and Utilities Commissioners and on a proposed System of Accounts of the Federal Power Commission.

The purpose of the committee in preparing this draft was to set down in definite form its views on the revisions which should be made in the present Uniform Classification of Accounts, adopted by the National Association of Railroad and Utilities Commissioners in 1922, to bring that up to date and more in line with present accounting practices.

# A Note on Public Utility Operating Property Accounting

By E. G. Hery
*Brooklyn Edison Company, Inc.*

THE trend toward greater detail in operating property accounting to permit the maintenance of continuing property records, with a resultant increase in accounting costs, demands careful consideration of the economic aspects of various accounting methods which have been developed to meet the requirements. Only current accounting methods for additions and retirements are considered herein, as the taking of an inventory and the establishment of the original property record are fundamentally distinct problems.

In general, operating property may be divided into two classes for accounting purposes; namely, inside plant and outside plant. Inside plant is for the most part located on company-owned premises and embraces stations and station equipment, office buildings, storerooms, and other service buildings. This class consists chiefly of small quantities of large items of relatively long service life without frequent major changes or renewals. Outside plant is for the most part located on other than company-owned premises (such as city streets) and embraces ducts, mains and other distribution facilities. This class consists chiefly of large quantities of small items of varying service life with more frequent changes or renewals of certain types of items. Property items such as transportation, office, storeroom, laboratory, shop, and tool equipment, may not fall strictly within either classification, but will be considered in the second class.

Because of the individual nature of accounting transactions for inside plant operating property, no detailed consideration will be given to this subject. Any complete work order system, or other method of identifying expenditures by job and location, provides the necessary data for cost analysis and entry in the continuing property record. The introduction of a radical change in accounting methods from a well-devised system developed over a period of time for local requirements, to an equally good or perhaps somewhat better and more modern system, would not result in appreciable savings.

In the field of accounting for outside plant operating property, however, it is much more frequently the case that the expansion of an old accounting system to meet the requirements of a continuing property record is unduly burdensome and expensive. In many cases, very sizable economies may be effected by a complete change.

For comparative purposes, five methods of accounting for outside plant investments are outlined in principle only, bearing in mind that innumerable combinations of these methods and entirely different methods may be used. No details are considered as to the forms for reporting labor and material charges, and for various ledger entries. Within any one method, considerable economy may often be effected by reduction in the number of entries, or by machine accounting. For convenience in this study, and with no other significance, names are assigned to the five methods outlined.

## Public Utility Operating Property Accounting

### Method 1. Job Order Accounting

Under this method, a separate job order (or other authorization paper) is issued for each job to be performed. The job order is usually set up by the department which performs the work, and a copy is sent to the Accounting Department, where a ledger sheet is set up to receive all charges against each job. In addition to the job order, a layout (or other detailed instruction) is issued to the construction forces. This method may be considered the most natural way of expanding an existing work order system to meet the additional detailed requirements of a continuing property record. For a utility company of any size, this method necessitates the setting up of thousands of ledger sheets annually. It requires the distribution of payroll charges daily and weekly to hundreds or even thousands of active job orders. It means thousands of detailed labor and material charge entries in the ledgers. It also means a complicated monthly allocation of indirect charges to the numerous ledger sheets. On completion of each job, a detailed analysis of the expenditures determines the cost of the various items or units of property installed on the job. Because of the excessive number of times that the same dollar of cost is handled (entered, balanced, etc.), in the accounting processes, this method of accounting is unjustifiably expensive. If exact identification of charges by job is necessary, all of the advantages of job order accounting may be obtained with very appreciable economies by the use of the following method.

### Method 2. Layout Accounting

Under this method, no job orders or job order ledger sheets are required. Direct charges for labor and material are reported against a standing account symbol for each operating property account, and the layout number of the particular job is also used. In the Payroll Bureau, layout numbers are ignored, and the daily and weekly distributions of charges are made directly to the twelve (or thereabouts) operating property accounts affected. In work in progress accounting records, layout numbers are likewise ignored, and only twelve ledger sheets are required (one for each operating property account). A simple monthly allocation of indirect charges to the twelve accounts is made. Approximately the same amount of analysis work (from tabulations of labor charges, and from material slips filed in order numerically by layout number) as in Method 1, determines the direct costs of the units of property installed on each layout. Indirect costs are then applied to the cost of each unit of property on the same percentage basis as was used for the allocation in the work in progress ledgers. The cost of this method of accounting may be justifiable for some operating property accounts, but further economies may be effected by the use of the following method.

### Method 3. Group Layout Accounting

Under this method, the same procedure as in Method 2 is followed up to the point of analyzing costs. For anal-

ysis purposes, all of the units of property completed in a given month are associated with the total cost of the group of completed layouts. This total cost is determined as the sum of the direct labor and material charges for the individual layouts, plus the proper percentage of indirect costs determined as a lump figure against the sum of the direct costs. The total (direct and indirect) cost of the group of layouts is then allocated to the various sizes and kinds of units of property on the basis of predetermined ratios. Inasmuch as the exact direct cost per layout may be determined whenever desired, as in Method 2, occasional analysis of individual job costs permits a check on the accuracy of the predetermined ratios. This method of accounting is not too expensive for some accounts, but additional economies available in following methods should be considered.

**Method 4. Controlled Process Accounting**

Under this method, the same procedure as in Methods 2 and 3 is used up to the point of analyzing costs. For analysis purposes the costs of particular jobs or groups of jobs are not definitely associated with the units of property installed on those jobs. Instead, the costs accumulated against work in progress for each operating property account, are cleared periodically or progressively against all completed units of property. The basis for clearing is the estimated cost of the completed units. The control feature of this method lies in a constant check of actual unit costs by the analysis under Method 2, of the costs of a portion of the jobs. For example, 5 per cent of all jobs may be analyzed in detail. This control feature may be likened to a common practice in manufacturing whereby a given percentage of a production process is carefully checked and tested. It may also be likened to the common utility company method of testing its fuel. This method of accounting is economical, and furnishes a checkable answer to the question of why a certain estimated cost is being used to clear costs out of work in progress. It also acts as a good barometer in promptly detecting a changing trend in unit costs. This method is suitable for such operating property accounts as ducts, feeders and mains.

**Method 5. Process Accounting**

Under this method, direct labor and material charges are reported only against a standing account symbol for each operating property account (without indicating the layout number of the particular job). Payroll and work in progress accounting are as in Methods 2, 3, and 4, that is, directly by operating property account. For analysis purposes, costs accumulated against work in progress for each operating property account

(*Continued on page 350*)

# John J. O'Brien

JOHN J. O'BRIEN, President of H. M. Byllesby & Co., and the Standard Gas and Electric Company, one of the foremost utility executives of the country, died on August 7th, at his home in Chicago. He was 67 years old.

Mr. O'Brien had been ill of cerebral and heart ailments for three weeks.

A native of Chicago, he was the son of James and Bridget Long O'Brien. His formal education was in the local parochial and public schools and a business college. He went to work for the Pullman Company when he was only 18 and two years later became connected with the United Edison Company.

When this company was merged with General Electric Company in 1892 he became accountant in charge and remained with the company until 1902, when he became associated with Colonel H. M. Byllesby. Mr. O'Brien aided in the formation of Byllesby company and was its treasurer and general auditor until 1924, when he succeeded Colonel Byllesby as president.

The utility operating companies which have functioned since that time under his management serve more than 1600 towns in twenty States. He was a director and officer in virtually all the large Byllesby holding companies. He was also a director of the Harris Trust and Savings Bank.

Mr. O'Brien was a member of the Union League, Mid Day, Electric and Butterfield Clubs of Chicago and of similar organizations in several other cities.

He is survived by a daughter, Mrs. H. F. Carbaugh; three sisters, Misses Margaret and Nellie O'Brien and Mrs. Joseph E. White, and three brothers, Martin J., who is public administrator of Cook County, Illinois; Peter J. and William P. O'Brien.

Besides his utilities holdings in the United States, Mr. O'Brien was one of the chief organizers some years ago of the Mexican States Public Service Company, Inc., a vast concern which now supplies power to several states in Mexico.

# "—and Incidentally Electric Service"

(*Continued from page 324*)

It is not the purpose of this discussion to enter into the relative merits of public and private ownership, but if comparisons are to be made either the additional items should be taken from the company package or corresponding items added to the TVA and municipal package. As compared with the average rate of 1.54 cents per kilowatt hour received for all of the energy sold by the TVA to outside purchasers, the average price received for all kilowatt hours sold by the Utah Power & Light Company in 1935 was 1.89 cents, and if adjustment be made for financing in the open market against use of tax money, and eliminating all extraneous costs plus the additional direct cost of public regulation and public reports required by the numerous Federal and State Bureaus and Commissions, the corresponding comparative amount received and retained by the company for actually producing and delivering electric energy would be approximately 1.2 cents. This subject again offers enough material for a complete discourse, but time permits only the brief comparison which has been offered.

Now having patiently listened to this discussion with its Hydra-headed subject, you are perhaps wondering "—incidentally electric energy"—so what?

Well—I have endeavored to acquaint you rather sketchily with a typical power supply system and its operation; at the same time to brush aside a lot of foggy thinking and expose some of the subterfuge of loading electric power and utility companies with ultimate plans of nationalization. I have not attempted to discuss pro or con social problems or the planned economy. In these days of the flood tide of new theories and revolutionary doctrines I am only crying like the Mississippi negro, "River Stay Away from My Door".

# Sales Committee Makes Business Building Plans

By C. E. Greenwood
*Commercial Director, Edison Electric Institute*

FORWARD progress in marketing has been indicated by the expansion of effort through all commercial committees of the Institute. An Association year with marked achievement closed on July 1st, and the schedule of activities for the next twelve months aims to intensify selling and promotion. Mr. H. P. J. Steinmetz closed a successful administration of the Sales Committee with two years of service, and President C. W. Kellogg has appointed Davis M. DeBard, Stone and Webster Service Corp., as Chairman of the General Sales Committee to succeed Mr. Steinmetz.

**Davis M. DeBard, Chairman Sales Committee**

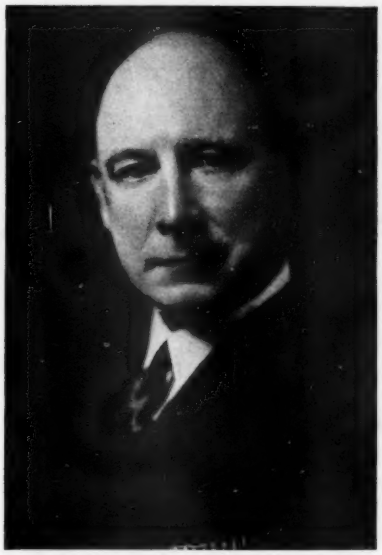
Mr. DeBard is a Tennesseean by birth. He was graduated from Cornell University, in Mechanical Engineering, in 1909. The following year he entered the Stone and Webster organization, and except for a period of five years, has served in its sales department since that time. Mr. DeBard tried out the shoe business in that five-year recess, being employed in the Finance and Promotion Divisions of Walkover Shoe Company in Brockton, Mass.

At the present time he is serving as Sales Engineer for Stone and Webster Service Corporation and the Engineers Public Service Company, Inc.

Mr. DeBard was long an active member of the National Electric Light Association and organized the first New England Power Engineers Club, an idea which has been extended in numerous other sections of the country. He has been a diligent member of the Sales Committee of the Institute and was Chairman of the Table Cookery Program when it was organized in 1934. Mr. DeBard's high capabilities along commercial lines, his thoroughness and his driving power, assures achievement in the work of the Sales Committee.

**Sales Committee Meeting**

The initial meeting of the year was called by the Chairman on July 21st in order that an early start might be made by the Committee. Although the personnel of the Sales Committee had not been completed, or that of its subdivisions, several Committee Chairmen were able to present a schedule of activity for 1936-37, and accomplishments of the past year were summarized.



**DAVIS M. DeBARD**
*Chairman, Sales Committee, E.E.I.*

The *Air Conditioning Committee,* under the leadership of Mr. Michel for the past three years, has centered its attention on the stabilization of a rapidly growing industry. As previously reported in the BULLETIN, a Definition of Air Conditioning as recommended by the Air Conditioning Manufacturers Association and the American Society of Refrigerating Engineers, and as coordinated through the National Better Business Bureau, was reviewed and endorsed. Wide publicity has been given to this Definition and it is expected that normal policing may prevent the term "Air Conditioning" from being abused by other trades that would ride on the popularity of the term, and the service. An attempt is being made to organize a statistical service, through E.E.I. Headquarters, on Air Conditioning installations similar to that on Refrigeration. This can only be successful if more complete and reliable records are obtained locally through the utility company. The usual Annual Report of the Committee has been unavoidably delayed, but publication is expected in early September.

J. D. Noyes, who will continue as Chairman of the *Wiring Committee,* advises that a published report on lower cost wiring methods and other information pertaining to the present wiring problems will be the first work of that committee for the coming year, and distribution may be expected in the fall.

The *Industrial Power and Heating Committee* under H. C. Webb, Jr., continues with its basic studies and will carry forward its last year's program. Much of the work of this Committee should be crystallized into action during the next few months. The Second Annual National Power Conference is a scheduled feature, and will be held the same week as the General Sales Conference.

The *Lighting Sales Committee,* which has been inactive by reason of the Better Light-Better Sight Program, will be restored under the leadership of M. N. Waterman of the Central Hudson Gas and Electric Company, Poughkeepsie, N. Y. The immediate work of this Committee is the carrying through the utilities a program on commercial and industrial lighting promotion which will be sponsored by the Better Sight Bureau.

The importance of placing renewed emphasis on the commercial load was indicated in the appointment of a *Commercial Sales Committee* a few months ago. However, the enforced resignation of the Chairman handicapped the progress of its work. Organized to give consideration to the increase of business among so-termed retail customers, the Committee will concern itself with the electrical loads under approximately 25 horsepower capacity, including refrigerators, counter commercial cooking equipment, strip heaters, ventilating and other small power. P. M. Alden of the Philadelphia Electric Company has been appointed Chairman, and the effective work that Mr. Alden has been doing in this field in his own company assures helpful study and information coming out of the deliberations this year.

The *Rural Sales Committee,* which has likewise been inactive except for the publication of the *Rural Electrification Exchange,* part of its work being absorbed by the Electric Water Systems Council, will be reorganized. The activity of the utilities in the field of rural electrification make it most essential that

this committee be appointed. *Rural Electrification Exchange* will continue to be published, possibly monthly rather than bi-monthly. Studies will be made into the load potentialities on the poultry farm, dairy farm and the like. The Committee will concern itself only with the load building development on the farmstead and not in the ordinary household appliances.

Chairman DeBard presented for consideration, and the Sales Committee approved, the appointment of Committees on Household Economics, Water Heating, and on Financing.

Utility women are to have a place in the sun. Although prominently identified with commercial promotion and contact with the public locally, women engaged in home service and as home lighting service supervisors have not been identified recently with any national committee. Miss Florence Freer, Home Service Director of Brooklyn Edison Company, will head the *Household Economics Committee* and early announcement of a program of activity may be anticipated.

Mr. Kinsey Robertson, President, Idaho Power Company, has accepted the Chairmanship of the *Water Heating Committee*. The fact that the president of a company so prominently identified with water heating development will lead this committee assures us of a year of unusual achievement. Electric Water Heating Service is working out of the pioneering stage and rapid development in this much desired load is expected.

No greater problem confronts the utility and the dealer of all classes today than the financing of electrical equipment. The subject has commanded the considerate attention of the entire industry. Government financing plans, new plans of investment bankers, lowered interest rates, local finance arrangements by utilities and other outlets have been developed, so that the study of the general subject will be timely and valuable. A *Committee on Financing Equipment* has been organized with C. L. Harold, Brooklyn Edison Company, as Chairman, and will produce a report for publication and distribution.

#### National Cooperative Programs

If one would doubt the effectiveness of National cooperative promotion in the development of our electrical business, one only need to scan the record of achievement in these programs, and the reaction of the manufacturers who support them jointly with the utilities and others, to get set right. Of the four National programs now in operation, three are in their third year. Every one of them is continuing because of the desire of the manufacturer, and his willingness to continue coordinated promotion.

*Poster to advertise Electric Buffet Service Month*

At a recent meeting of the *Electric Water Systems Council* it was decided to continue the Running Water Program under the leadership of P. H. Powers, its present Chairman, and the utilities have been advised of the availability of 100,000 more booklets to be used in connection with the sale of Electric Water Systems in rural and semi-rural districts. The sales of these pumps doubled in 1935 over 1934, and the first six months of this year are running nearly 50 per cent over last year.

Inventory of two years of activity of the *Better Light-Better Sight Bureau* was taken at its annual meeting on August 4th. This program, acknowledged as one of the most expansive promotional ventures in recent years, has established itself under the Chairmanship of M. E. Skinner. This is a sustained program that continues in its social, educational and commercial phases to produce profitable results for the many associations joined in the effort. The sale of Light for Seeing is established on a strong foundation, and the potentialities for future educational and commercial progress is unbounded.

The I.E.S. approved portable lamp is becoming an accepted item in choosing lamps for the home. An unusual feat was proposed in placing the goal for one month's sales in October at 1,000,000 lamps. There was some skepticism of such accomplishment. However, reports confirmed at the last Bureau meeting indicate the possibility that not only will the million goal be reached, but it will be surpassed if the manufacturers are able to supply the product. The contribution to better business in such a program is shown in the fact that the lamp factories are now working day and night to fill standing orders. An extensive national advertising campaign precedes the intensified October selling.

Plan Books are now being distributed to utilities and distributors covering the last six months' program of the *Electrical Housewares Committee,* headed by H. P. J. Steinmetz. October is National Electrical Buffet Service Month, and in December will be held the Second National Electrical Housewares Week. Following customary practice, there will be a two-color poster for each campaign together with stickers, and mats with prepared advertising copy for local newspapers. The reverse side of the poster will contain complete details of a Window Display Contest with prizes totaling $400 for three different classes of retail outlets, and a special prize for the wholesaler who enters the greatest number of his dealers in the contest.

National Electrical Buffet Service Month will capitalize the new and virtually unexploited market for electrical housewares created by the popularity of buffet entertaining. By special arrangement with General Foods Corporation there will be an interchange of advertising help. Announcements regarding Electrical Buffet Service Month will be

made four times each week during October in National hook-up broadcasts. Grocers will be urged to install Buffet Service displays. Utilities will be urged to tie in with General Foods Corporation in their store and window displays. Such publicity cannot fail to produce a broad public interest.

In November the *National Kitchen Modernizing Bureau* will complete its first fiscal year of operation. Plan Books were not distributed until March, so that a full year of achievement cannot be recorded. A review of the comprehensive Report of field activity to date, recently printed and distributed, with stories of local coordinated promotion, is convincing of the remarkable response to this movement. Under the driving power of Chairman G. E. Whitwell, and the Executive Committee, the program has been established in more than a hundred communities. Field men have covered 36 states, and at the time of writing, 44 local Kitchen Modernizing Bureaus have been established. The Committee is hopeful that this Program will be greatly expanded in the coming year. A firm foundation has been established on which to build a promotional super-structure. There could be no greater opportunity for practical and profitable cooperative effort.

### World Power Conference

In connection with the meetings at the World Power Conference in September at Washington, D. C., there will be Exhibits at various locations sponsored by Government Bureaus and engineering groups.

Edison Electric Institute will visualize in a series of charts the growth of the utility industry in the United States, and this display will be supplemented by a complete Commercial Exhibit, showing the type of promotional programs, such as Better Light-Better Sight, Kitchen Modernizing, Electrical Housewares and Electric Water Systems, that are helping to speed the building of the domestic load. The entire Chinese Room at the Mayflower Hotel will be occupied by the E.E.I. displays.

# Safety Codes Available

THE following is a list of the safety codes that have been approved by the American Standards Association, together with the number designation, title and price per copy of each code. This information is published in the E. E. I. BULLETIN in accordance with action taken by the Accident Prevention Committee at a meeting held in Detroit, Michigan, May 10th and 11th, 1936.

Any of the safety codes listed may be obtained from the American Standards Association, 29 West 39th Street, New York City, at the price per copy as indicated, or, if quantities are desired, at special discount prices.

| | | |
|---|---|---|
| A2-1934 | Fire Tests of Building Construction and Materials (ASTM C 19-133) | $0.25 |
| A9-1935 | Building Exits Code | .75 |
| A10-1934 | Safety in the Construction Industry ("Manual of Accident Prevention in Construction," by Associated General Contractors of America) | 2.00 |
| A11-1930 | Lighting Factories, Mills and Other Work Places, Code of | .20 |
| A12-1932 | Floor and Wall Openings, Railings and Toe Boards, Safety Code for | .20 |
| A14-1935 | Ladders, Safety Code for the Construction, Care and Use of | .25 |
| A17-1931 | Elevators, Dumbwaiters and Escalators, Safety Code for | 1.00 |
| A23-1932 | School Lighting, Standards of | .20 |
| A39-1933 | Window Cleaning, Safety Code for | .20 |
| B7-1935 | Abrasive Wheels, Safety Code for the Use, Care and Protection of | .10 |
| B8-1932 | Protection of Industrial Workers in Foundries, Safety Code for | .20 |
| B9-1933 | Mechanical Refrigeration, Safety Code for | .30 |
| B11-1926 | Power Presses and Foot and Hand Presses, Safety Code for | .20 |
| B13-1924 | Logging and Sawmill Safety Code | .60 |
| B15-1927 | Mechanical Power Transmission Apparatus, Safety Code for | .35 |
| B24-1927 | Forging and Hot Metal Stamping, Safety Code for | .15 |
| B28a-1927 | Rubber Mills and Calendars, Safety Code for | .05 |
| C1-1935 | Electric Wiring and Apparatus in Relation to Fire Hazard (National Electrical Code) | .05 |
| C2-1927 | National Electrical Safety Code | |
| | The information contained in this code is available in the following separate publications: | |
| | Handbook 6—Installation and Maintenance of Electrical Supply Stations (Part 1 of NESC) | $0.10 |
| | Handbook 7—Installation and Maintenance of Electric Utilization Equipment (Part 3 of NESC) | .15 |
| | Handbook 8—Safety Rules for Operation of Electrical Equipment and Lines (Part 4 of NESC) | .15 |
| | Handbook 9—Safety Rules for Radio Installations (Part 5 of NESC) | .10 |
| | Handbook 10—Installation and Maintenance of Electrical Supply and Communication Lines (Part 2 of NESC) | .60 |
| | Handbook 16—Wood Poles for Overhead Electrical Lines (Supplement to Handbook 10) | .10 |
| C5-1933 | Lightning, Code for Protection Against | .15 |
| | Part I, Protection of Persons | |
| | Part II, Protection of Buildings and Miscellaneous Property | |
| | Part III, Protection of Structures Containing Inflammable Liquids and Gases | |
| D1-1925 | Aeronautic Safety Code | 1.50 |
| D3-1927 | Colors for Traffic Signals, Safety Code for | .25 |
| D4-1927 | Brakes and Brake Testing, Safety Code for (Bur. Stds. Misc. Pub. 107) | .05 |
| D6-1935 | Manual of Uniform Traffic Control Devices for Street and Highways | .50 |
| K2-1927 | Gas Safety Code | .20 |
| K13-1930 | Gas-Mask Canisters, Code for Identification | .05 |
| L1-1929 | Textile Safety Code | .05 |
| M2-1926 | Installing and Using Electrical Equipment in Coal Mines, Safety Rules for | .05 |
| M10-1928 | Miscellaneous Outside Coal Handling Equipment, Recommended Practice for | Out of Print |
| M12-1928 | Ladders and Stairs for Mines, Recommended Practice for the Construction and Maintenance of | .25 |
| M13-1925 | Rock Dusting Coal Mines to Prevent Coal Dust Explosions, Recommended Practice for | .25 |
| M14-1930 | Explosives in Bituminous Coal Mines, Recommended Practice for the Use of | .25 |
| M15-1931 | Coal Mine Transportation, Safety Code for | .20 |
| M17-1930 | Fire Fighting Equipment in Metal Mines | .25 |
| O1-1930 | Woodworking Plants, Safety Code for | .10 |
| P1-1925 | Paper and Pulp Mills, Safety Code for | Under Revision |
| Z4.1-1935 | Industrial Sanitation in Manufacturing Establishments, Safety Code for | .20 |
| Z4.2-1935 | Drinking Fountains | .10 |
| Z4.3-1935 | Sanitary Privy (Supplement Number 108 to the Public Health Reports) | .10 |
| Z8-1924 | Laundry Machinery and Operations, Safety Code for | .05 |
| Z12 | Safety Codes for Dust Explosions | .25 |
| | These are included in two bulletins and consist of the following: | |
| | Pulverizing Systems for Sugar and Cocoa | |
| | Prevention of Dust Explosions in Coal | |
| | Pneumatic Cleaning Plants | |
| | Prevention of Dust Explosions in Wood Flour Manufacturing Establishments | |
| | Prevention of Dust Ignitions in Spice Grinding Plants | |
| | Use of Inert Gas for Fire and Explosion Prevention | |
| Z26.1-1935 | Safety Glass, Safety Code for | .20 |
| Z33-1935 | Fire Protection Code for Blower and Exhaust Systems | .10 |

# Annual Meeting of Better Light-Better Sight Bureau

THE Third Annual Meeting of the National Better Light-Better Sight Bureau was held in New York August 4th. Reports were made on the progress of the Better Light-Better Sight Movement and plans outlined for future activities.

Among the many activities which the Bureau will endeavor to stimulate during the coming year will be—

1. Continued promotion of better seeing in the home.
2. Increased concentration in the commercial and industrial fields.
3. Intensified efforts for the sale of proper seeing equipment.
4. Promote light prescribing technique among Vision Specialists.
5. Joining in the national program for greater safety on highways.
6. Encourage better schoolroom lighting for protection of young eyes.
7. Develop more local cooperative programs among those directly concerned in promoting eyesight conservation.

The following officers were reelected for the ensuing year:

M. E. Skinner, *Chairman*
M. J. Julian, *Vice-Chairman*

Chairman Skinner reappointed C. E. Greenwood, J. F. O'Brien, H. P. J. Steinmetz and H. F. Barnes, who with the officers constitute the Executive Committee. G. R. Trumbull was reappointed Secretary-Manager.

In the annual report submitted to the Bureau members by Chairman Skinner and Manager Trumbull a general survey of activities and accomplishments of the Better Light-Better Sight Movement for the past year were received.

It was emphasized that the important thing is to make people everywhere fully conscious of the value of their eyes, to cause them to take thought about the proper use and care of their eyes, and to move them to do those things that are necessary to prevent eye trouble or to have eye trouble cared for in time to avoid partial or total blindness.

It is in the field of education that the Better Light-Better Sight Bureau through an earnest application of its principles to the public by its members and all others that may be induced to follow, that a human welfare service of inestimable worth can be done.

"The very nature of the Better Light-Better Sight movement has been conducive to real cooperative efforts," the report stated. "Its broad scope has opened the way for closer work within industries and among industries. In the electrical industry new relationships have been created—a better feeling exists among various groups because of the new markets opened up for the sale of equipment and materials for better seeing.

"Utility lighting engineers and specialists, electrical manufacturers, wholesale and dealer lighting engineers totaling more than 5000, trained and encouraged to sell better seeing, now include correction of eye defects, benefits of healthy eyes, and advantages of proper wall and ceiling reflecting surfaces in their presentations to customers.

"During this past year many millions of people have definitely been made light and sight conscious by the educational and promotional efforts of the Bureau member organizations and by the sympathetic cooperation of national magazines, trade press, newspapers, welfare societies and other bodies and individuals interested in human welfare.

"Notable instances of industry cooperation during the past year was the Better Sight Week promoted last fall in over 50 large cities in which the local optical and utility interests joined hands to feature eye care and proper light for better seeing.

"The Save Your Vision Week held last February, an annual affair of many years' standing, and promoted by the American Optometric Association and Better Vision Institute, was actively supported in over 50 cities by local utilities, Sight Saving Councils and Better Sight Bureaus.

"The National Clean Up and Paint Up Campaign, an activity promoted by the National Paint, Varnish and Lacquer Association, and a very successful promotion reaching countless thousands throughout the country every year, was entered into this past year by utilities and Sight Saving groups in several large cities. In some instances, the local campaign slogan was enlarged to National Paint Up, Clean Up, Light Up Campaign.

"The National Furniture Week promoted annually during the month of November by the Furniture Industry through the National Retail Furniture Association was joined by a number of utilities and Better Sight Bureaus keen enough to see the opportunity for furthering Better Light-Better Sight by featuring and selling Better Sight lamps.

"The nation-wide program on store front modernization jointly promoted by Pittsburgh Plate Glass Company and the Westinghouse Lamp Company is a splendid example of industry cooperative methods.

### Advertising

"The volume of magazine and newspaper advertising exceeded even that of the year before.

"In 23 of the leading national consumer magazines, including the Saturday Evening Post, Ladies' Home Journal, Good Housekeeping, Woman's Home Companion, McCall's, Parents, Pictorial Review, Time and others of like character, advertisements in from one to several issues and from one column to full page space were run.

"These advertisements were placed chiefly by the large Mazda Lamp Manufacturers and confined in most instances to the social service aspects of the Better Light-Better Sight Program.

"Newspaper advertising carried on chiefly by Utilities and Sight Saving groups totaled over 6,000,000 column inches to a circulation of over 40,000,000. From the largest to the smallest of newspapers in every corner and section of the country these advertisements appeared.

"Over 185 pages of trade paper advertising were run in electrical, paint and optical publications.

"Over 200 radio stations were broadcast messages consistently throughout the year to many millions of listeners.

"Over 16,000,000 pieces of direct mail material of various kinds are estimated to have been mailed and distributed by members of the electrical, optical and paint industries.

"Over 100,000 window, counter and display cards of many designs and sizes were used pertaining to Sight Saving and Better Light-Better Sight.

### Light Prescribing Technique

"Introduced about a year and a half ago to the electrical industry and optical fraternity, the progress of light prescribing technique development has been watched very carefully by the Bureau executive committee and many others most directly concerned in the National program.

"More than 1500 sets of light prescribing equipment have been installed to date and the general reception and opinion of the practitioner has been satisfactory.

"During this past year over 800,000 I.E.S. Better Sight lamps have been sold bearing the certification tag and in addition it is conservatively estimated that an equal number have been sold without tags. The stage is now being set for the sale of 1,000,000 in the one month of next October.

"Men and women prominent in the sciences, professions and business have made addresses to thousands which have inspired others to take up the program and pass it on to local groups, organizations and general public gatherings. During the past year it is estimated that representatives of the Edison Electric Institute, Better Vision Institute, General Electric Company, Westinghouse Lamp Company, Illuminating Engineering Society and several other participating bodies have talked to over 500 meetings with audiences totaling more than 100,000 people, many of which have been annual conventions of national associations and important industries.

"The result has been a further projection of these talks in hundreds of communities throughout the country.

"Members of local Sight Saving Councils, Better Sight Bureaus, utility and manufacturers' organizations are estimated to have made during this past year addresses to over 5000 public audiences covering 500,000 persons.

"The Bureau will certainly encourage continuance of public speaking at every opportunity."

# Handy Annie Had a Busy Year

**By C. M. Ripley**

LAST year, Handy Annie worked in 21¼ million homes. This was half a million more than in 1934, a million more than in 1933, and twice as many as in 1922. Last year:

The average housewife paid her 66 cents a week wages.

She did 43 per cent more work than in the boom year of 1929; and twice the work of 10 years ago, but got only 50 per cent more pay than ten years ago.

She cooked more than 1½ billion meals.

She washed 6½ million tons of clothes and ironed probably twice as much.

She made ice and kept the food pure in 7¼ million homes—1½ million more than in 1934, and twice as many as in 1931. She gained a new refrigeration job every 5 seconds of every business day throughout the year.*

Her total work exceeded the building of ten of the largest pyramids in Egypt.**

### A Thumbnail Biography

How Annie, like Cinderella and Joan of Arc, emerged from obscurity and gained her high place in public esteem, is a romance of slow, early growth, succeeded by more and more rapidly accelerating ascendency.

Annie was born on Pearl Street, New York, on September 4, 1882, in Edison's power plant—her lullaby, the hiss of steam and whir of dynamos. She was a backward child—considered somewhat of a nuisance—like the neglected Cinderella. All she could do was just light a few houses of the rich.

She was 18 years old in 1900. By that time, she was lighting 1 million homes, and bit by bit, she had learned to run crude fans, toast bread, iron clothes (which she often scorched) and a few more other small jobs, at none of which did she show much skill.

By 1905, she had learned to toast, but only on horizontal grills.

In 1910, she was 28, an expert at pumping water and was trying to learn to clean floors. She tried her hand at cooking but many called her too slow.

In 1914, Annie boasted of refrigerating the food in 600 homes, but it seems she did not make much of a hit, for it was 11 years later before she was doing enough of this kind of work to show on a curve. (Page 41 of the *Electrical World,* May 25, 1935.)

(Few people then dreamed that within just 10 more years, she would take over the refrigerating job in 750 more homes each hour of every business day throughout the year.)***

In 1915, she was lighting 5 million homes, ironing in 2 million, cleaning the floors in a quarter of a million.

From 1917, on, events moved swiftly. For 13 consecutive years, Annie averaged a million *more* homes to light every year!

By 1922, the lighting of 10 million homes constituted three-quarters of her work, although she was ironing in 7 million, cleaning floors in 4, and washing in 2.

The momentous year of 1925 marked the great turning point in Annie's career. Previous to this, she had the "extensive" concept, i.e., her ambition in life was to find more and *more places* to work. But in 1925, a new urge was superimposed above the old—the "intensive" concept, i.e. to do *more work* in each place. Because of this two-dimensional ambition, Annie's achievements "square" themselves; for if

**She does three times as many jobs in three times as many homes, then her work is nine times as great!**

Thus, her new ambition further accelerated her ascendency, for her progression has changed from arithmetical to geometrical.

Previous to this important year of 1925, she had done heavy-duty power jobs, and she had served millions; but

(1) the big power jobs were done for only a few, and
(2) she served the millions in only a small way.

It was in 1925 that she started out in earnest to do her first big power job on a grand scale; for she mastered the art of refrigeration!

Brilliant engineering, ingenious manufacturing, and commercial daring provided Annie with new refrigerating tools, as follows:

(1) The well-insulated all-steel box; plus
(2) A guaranteed mechanism needing no oiling; having no fan, pulley, belt, or stuffing box; and sealed against air, dust, and moisture; then
(3) Both these engineering features brought into mass production, speeded by electric welding; and
(4) Sales stimulated by aggressive sales promotion—and

All these four elements combined for the first time!

Presto—the new combination worked!

On January 1, 1926, there

* Based on a 40-hour week.

** 1 kwhr equals the muscle work of 13 men for one hour. So the 14 billion kwhr used in American homes in 1935 equals one million men's work for 20 years. This is ten times that required to build the Pyramid of Cheops, according to Herodotus.

*** Based on a 40-hour week.

were 142 thousand domestic electric refrigerators *in use* from coast to coast. But—during that same year, 205 thousand *more* were *sold*—more *sold* that year than the total number *in use* on the first day of that same year!

In 1927, Annie refrigerated in a third of a million *more* homes; in 1928 still half a million *more*. In the years 1929 to 1932 inclusive, better than three-quarters of a million *more* each year. In 1933, a full million *more!* In 1934, a million and a quarter more! In 1935, a million and a half *more!!!* Now, she does the refrigeration in 7¼ million homes.

Its Magic! Its Romance! (Some of the old abandoned ice houses are now used for growing mushrooms.)

But, I am a bit ahead of my story. In 1927, besides lighting an additional million homes, she began taking over the running of the radio, and she averaged 2 million *more* radios each year for 10 years!

By this time, she was lighting 20 million homes, ironing in nearly all of them, cleaning the floors in 9 million, washing in 7, refrigerating in 3, and cooking in one million.

By 1930, she had shown herself the mistress of the art of washing dishes.

In 1933 (at 51) Annie made a new high record—refrigerating in a million *more* homes that year, though all the banks were closed part of the time, and part of the banks were closed all of the time. The fact that she increased her work so much during the depression, shows that she is not a luxury but a necessity.

And now in 1936, she lights 21¼ million homes, irons and runs the radio in 21 million, washes, toasts and cleans the floors in 10, tells time in 9, refrigerates and makes coffee in 7, and does all the cooking in 1½ million. Although past middle age, she is still developing new talents; for now like a guardian angel, she will filter, humidify, and circulate your air, tend your furnace, prevent garbage in your kitchen and protect your eyesight.

So what Shakespeare said of Cleopatra is true of the far more useful Annie, i.e.:

"Age cannot wither nor custom stale her infinite variety."

And strange to say, the more jobs we give her to do, the less each job costs.

As Mark Twain said of Joan of Arc:

"A career and personality of extraordinary character," though "at 16 there was no promise of a romance."

### Annie Runs Races

Each year, a classic sporting event takes place in Indianapolis—the 500-mile auto race.

Each year we have the record of the two thrilling races between the various classes of electrical service:

*Race No. 1*

The "Revenue Race," which has been won by Annie every year since 1927. She not only out-distances but actually out-classes her competitors—and more each year!

*Race No. 2*

The "Work Done Race" (kilowatt-hours): Ten years ago, she ran fourth. Two years later, she climbed to third place, by nosing out "Railway Operations." Last year, she tied for second place with "Small Light and Power." From now on, she is the runner-up to overtake the present leader, "Wholesale Power & Light."

Doesn't "Accelerating ascendency" describe her brilliant performance?

Last year, her work was six times that of Street Lighting, was twice that of Electrical Transportation of all kinds, was equal to Retail Commercial; and was exceeded only by the "Industrial Giant who turns with tireless arms the countless wheels of toil."

So you don't do her full justice when you slightingly remark:

"Household electricity is only about 20 per cent of the total."

And you don't do Annie full justice when you remark, "She brings in only 37 per cent of the revenue." Last year, she brought in 709 million dollars, or

14 times that of Electrical transportation of all kinds;
7 times that of Municipal and Miscellaneous;
13 per cent more than Retail Power and Light; and
13 per cent more than Wholesale Power and Light.

When factory machinery is idle, she keeps on bringing back the bacon. Also, she brings almost as much in the summer as in the winter, and she is doing a lot of overtime work at night (off peak).

Last year, she brought in 90 million dollars *more* than in 1929; while Wholesale Power & Light brought in 80 million dollars *less*, and Retail Power & Light 19 million *less*.

*The Electrical World* sums it up in this sentence—"Domestic sales alone are above former levels."

These annual reviews are literally thrilling to those of us who are interested in the *human* side of the Light and Power industry, for they show our dreams are coming true!

Stuart Chase wrote in *Fortune* that all other uses of power "must take second place to the promise of power in actual *human living*. There lies its transcendant role in the years before us.

Owen D. Young, last year, wrote:

"We have spent ourselves, both time and money, in the creation of great machines. Now let us turn that energy and experience to building the most important mechanism of *human life*— a modern American home."

### The Future

The part Annie will play in the years to come staggers the imagination. I believe that long before 1950, her work will be equal in usefulness (kilowatt-hours) to the work now done by electricity in our mills, mines and factories.

### Factors Affecting Annie's Future

The new American home program will sell appliances in bunches like grapes; their first cost will be included in the mortgage, like the tubs and sink. The building boom is already getting under way. As *Electrical Merchandising* says, "There are 510,000 more appliance prospects than a year ago!" Yes, and a million more than two years ago!! Annie is already serving twice as many homes as 13 years ago, with more to come—both old and new, rural and urban.

Slum clearance will give Annie still more work to do. So will rural electrification.

Helen Foster says, "Women are finally beginning to be aroused to the fact that men in their offices and factories have been buying all the latest labor-saving machines almost as fast as they were invented; but that to date, the women have been almost left out of the picture as far as their homes are concerned."

Millions saw the model homes at Chicago's Century of Progress in 1933 and 1934. Most of these had electric kitchens and air conditioning.

Four million people saw the still more complete electric equipment in the new American demonstration homes. Doubtless, most of them now want electric kitchens, home laundries, automatic heat, and air conditioning.

Electricity is cheap. Appliances are lower in price and better than ever be-

*Continued on page 346)*

# Removal of Ice From Transmission Line Conductors

**By D. C. Stewart**

*Niagara, Lockport & Ontario Power Company, Buffalo, N. Y.*

Presented at the Detroit Meeting of the Edison Electric Institute Transmission and Distribution Committee, May 12, 1936

### Glaze Storms

GLAZE or ice storms result from a condition known as inversion of temperature. If the temperature at the surface of the earth is below freezing, and the upper air is above freezing, precipitation from the warm air above in the form of rain forms ice when it strikes cold objects at the surface of the earth. Normal transmission line load currents are seldom large enough to heat the conductors sufficiently to prevent the formation of ice. Accumulation of ice on the conductors is a matter of concern to power system operators for two reasons; first, the increased load due to the dead weight of the ice, in combination with the high winds and low temperatures which sometimes follow glaze storms, may stress the conductors or supporting structures to the point of failure; and second, the addition of ice to the conductor may result in the phenomenon of "dancing conductors" with resulting power outages.

Figure 1 gives meteorological data on a glaze storm which occurred in Western New York on December 17th, 18th and 19th, 1929. Except for its unusual severity, the progress of this storm is typical of most glaze storms.

### Prevention and Removal of Ice Formations

The only practical method thus far discovered for preventing ice from forming on conductors, or removing it after it has formed, is to heat the conductor sufficiently by the use of abnormally high currents. In most cases this necessitates removing the line from service, short circuiting it at one end, and applying sufficient voltage at the other end to furnish the required current.

### Method of Calculation

The temperature rise of a bare conductor suspended in air is dependent on the heat generated by the current flowing through it, its diameter, and the velocity of the wind transverse to the conductor. The following empirical equation, which represents an average of the results of three independent in-

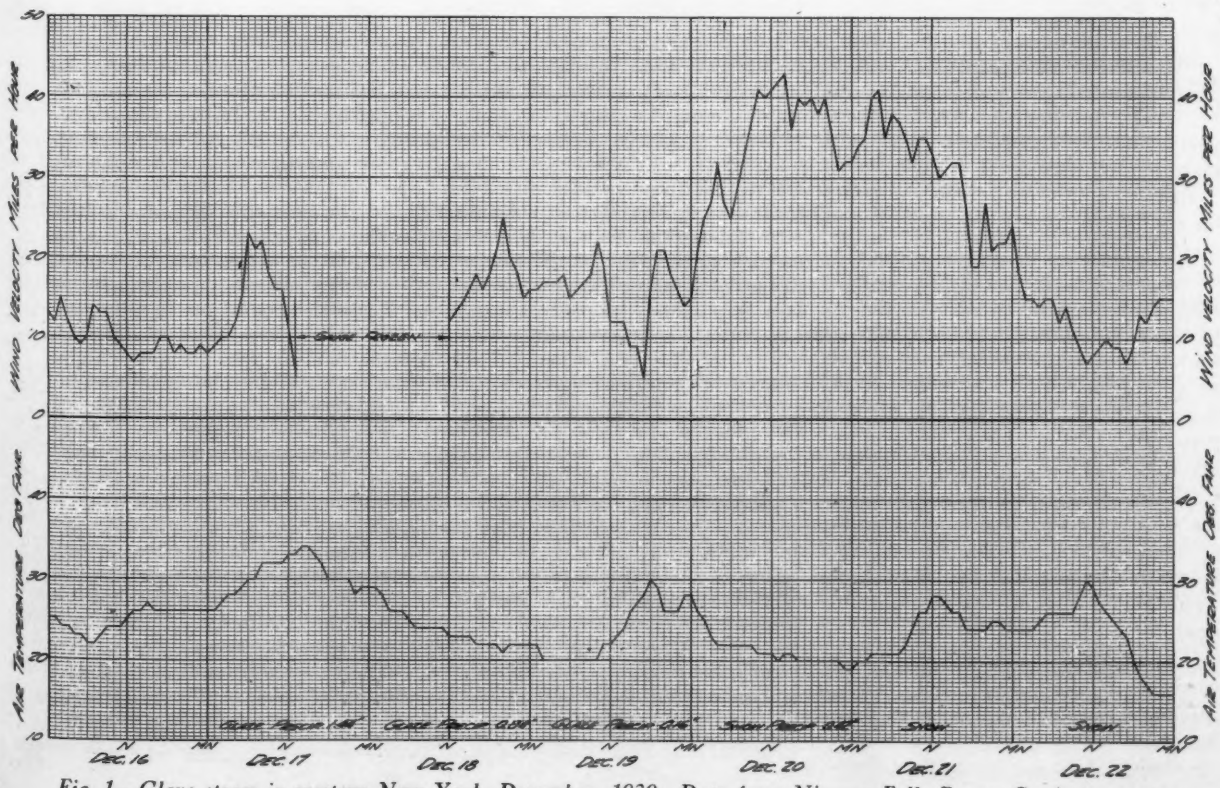



*Fig. 1—Glaze storm in western New York, December, 1929. Data from Niagara Falls Power Co. instruments*

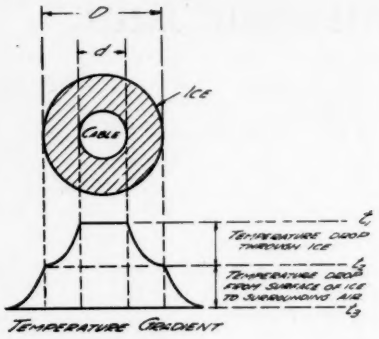



*Fig. 2*

vestigators, gives the relation between these variables.

$$W = \frac{I^2R}{1000} = 0.766\sqrt{d\,v}\,(t_1 - t_2) \quad (1)$$

where W = kilowatts per mile
I = current in amperes
R = resistance of conductor in ohms per mile
d = diameter of conductors in inches
$v$ = wind velocity in miles per hour
$t_1$ = conductor temperature in degrees Fahr.
$t_2$ = air temperature in degrees Fahr.

In Figure 4 the kilowatts per mile necessary to raise the temperature of the bare conductor one degree Fahr. are given at various wind velocities for a number of conductors commonly used for power transmission. In Figure 5 the kilowatts per mile generated as heat in the conductor by various currents are given for the same group of conductors.

In order to prevent ice from forming on a conductor it is necessary to maintain the temperature of the conductor several degrees above freezing. Assume that we wish to prevent the formation of ice on a 4/0 copper conductor, with a wind velocity of 10 miles per hour and an air temperature of 25° Fahr. From Figure 4 the kilowatts per mile per degree rise of the conductor temperature are 1.76. Allowing for maintaining the conductor temperature 8° above freezing to prevent ice from forming on it, the total temperature rise is 15°, and the kilowatts per mile $1.76 \times 15 = 26.4$. From Figure 5 the current necessary to produce this rise is 320 amperes.

The problem of melting ice from a conductor is more complicated. Figure 2 shows a conductor with a radial coating of ice. The transfer of heat through the coating of ice is given by the following formula:

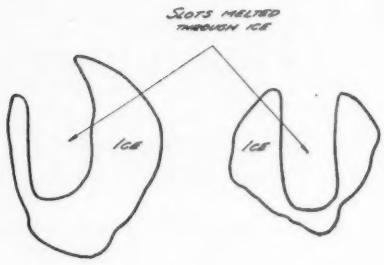



*Fig. 3*

$$W = \frac{I^2R}{1000} = \frac{5.12\,(t_1 - t_2)}{\log_{10}\frac{D}{d}} \quad (2)$$

where W = kilowatts per mile
I = current in amperes
R = resistance of conductor in ohms per mile
D = diameter over the ice in inches
d = diameter of conductor in inches
$t_1$ = conductor temperature in degrees Fahr.
$t_2$ = temperature of outer surface of ice in degrees Fahr.

Formula (1) may be used equally well to determine the dissipation of heat from the surface of the ice. The only difference is that d becomes D, the diameter over the ice, and $t_1$ becomes $t_2$, the temperature of the outer surface of the ice. Combining equation (1) modified in this way, with equation (2) gives the following:

$$W = \frac{I^2R}{1000} = \frac{5.12}{\log_{10}\frac{D}{d} + \frac{6.68}{\sqrt{D\,v}}}(t_1 - t_2) \quad (3)$$

As long as the current is insufficient to raise the temperature of the conductor to the melting point of ice, this heat is dissipated by conduction through the ice and by radiation and convection from

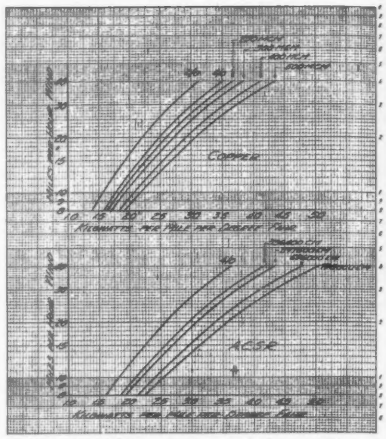



*Fig. 4—Kilowatts per mile to raise temperature of bare conductors 1° Fahr.*

the outer surface of the ice. In order to free the conductor of ice additional heat is required over that necessary to maintain the conductor at the melting point of ice and when this is supplied the conductor melts a slot through the ice about equal to its own diameter. This is shown in Figure 3 which gives some outlines made from actual traces of pieces of ice melted from conductors.

The heat necessary to melt this slot through the coating of ice is given by the following equation:

$$W_m = \frac{86.5\,A}{t} \quad (4)$$

where $W_m$ = kilowatts per mile
t = time in hours to melt the ice
A = area in square inches of the slot which must be melted through the ice to free the conductor

The heat necessary to maintain the temperature of the conductor at the melting point of ice (equation 3) plus

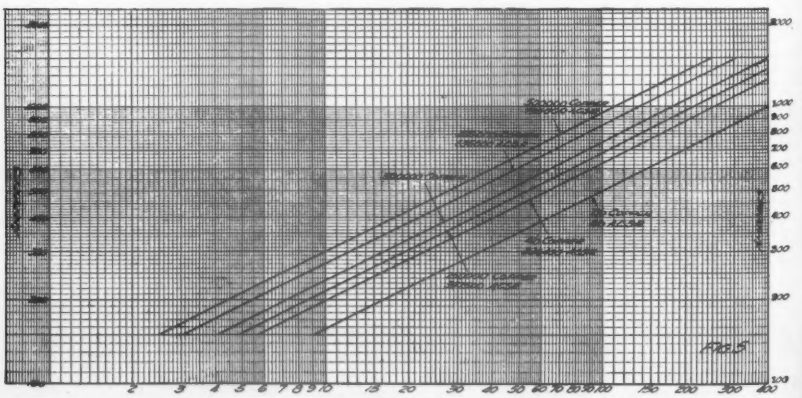


*Fig. 5—Kilowatts per mile $I^2R$ Loss in Conductor*

the heat necessary to melt the slot through the ice in any specified time (equation 4) gives the total heat necessary to free the conductor of ice in that time.

The curves on Figure 6 are prepared from equation (3) and Figure 7 from equation (4). To illustrate their use assume a typical problem.

Conductor 4/0 Copper
Air temperature 22° F.
Wind velocity 20 miles per hour
Thickness of ice 1 inch
Conductor to be freed of ice in 1 hour
Find the current required

From Figure 6 3.16 kilowatts per mile are required to raise the temperature of a 4/0 copper conductor 1° Fahr. with 1 inch thickness of ice coating and 20 miles per hour wind velocity. 3.16 (32-22) = 31.6 kilowatts per mile are required to maintain the conductor at the melting point of ice. From Figure 7 49.5 additional kilowatts per mile are required to melt a path through the one-inch coating of ice in 1 hour. The total kilowatts per mile necessary to free the conductor in 1 hour are 31.6 + 49.5 = 81.1. From Figure 5 the current is found to be 570 amperes.

In using this method it should be remembered that field conditions depart from the ideal conditions necessarily assumed in developing the formulae. The deposit of ice is never exactly concentric with the conductor and may vary in shape from point to point on a line. Temperatures and wind velocities cannot be expected to be uniform over any considerable distance and are bound to vary somewhat throughout the melting period.

Despite the difficulty of assigning correct values to these variables for any specific situation, results obtained by using the best possible estimates of the quantities involved have been in satisfactory agreement with calculated values. This conclusion is based on observation of melting operations on our system over a number of years. Some idea of the degree of accuracy possible can be obtained from several cases taken from our records.

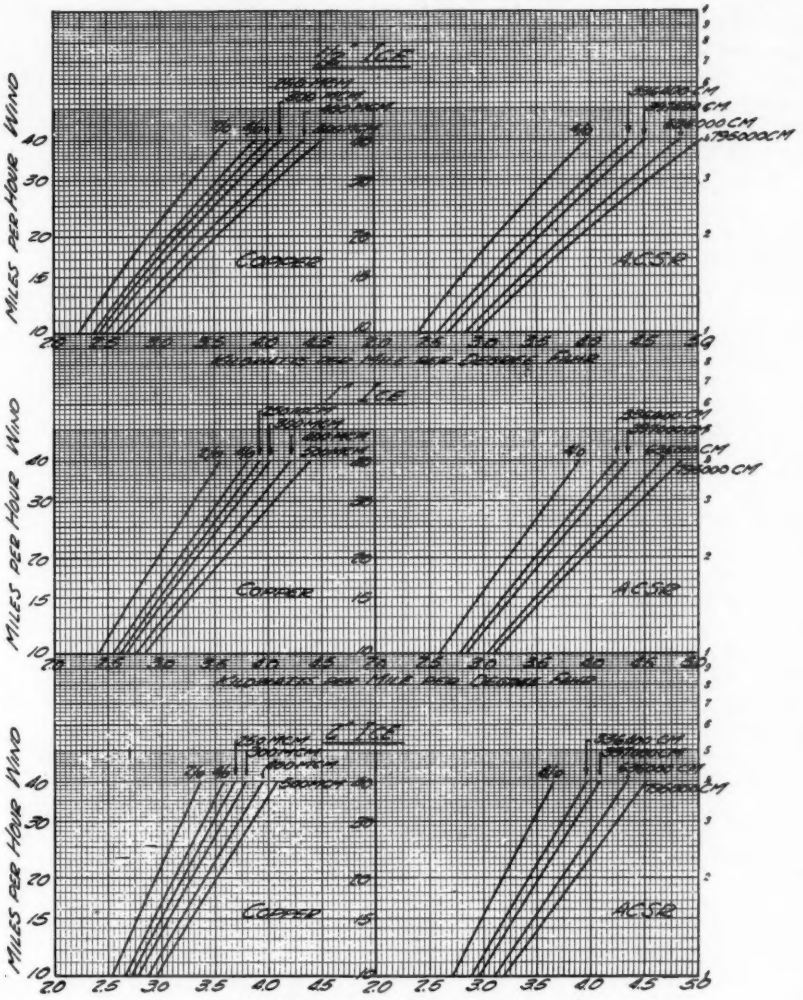



*Fig. 6—Kilowatts per Mile per Degree Fahr.*

Kilowatts per mile to maintain conductor at melting point of ice for each degree Fahr. that air temperatue is below 32° Fahr.

Estimated Average Conditions Throughout the Line

| Conductor | Thickness of Ice in Inches | Air Temp. Deg. Fahr. | Wind Velocity m.p.h. | Observed Time to Melt in Hours | Actual Amperes | Calculated Amperes |
|---|---|---|---|---|---|---|
| 300 MCM Copper.... | ½ | 20 | 16 | 0.6 | 750 | 684 |
| 400 MCM Copper.... | 1½ | 21 | 16 | 1.6 | 800 | 853 |
| 4/0 ACSR..... | ½ | 20 | 20 | 1.9 | 350 | 363 |
| 336,400 ACSR ..... | ¾ | 9 | 10 | 2.5 | 560 | 560 |

### Operating Practices

Several methods are available for furnishing voltage and current to prevent or remove ice formations.

1. Using synchronous machines to increase the wattless current and thus increase the line current.
2. Shifting load to one circuit which is normally carried over two or more circuits.
3. Locating transformers at strategic points on the system, with secondary or tertiary windings of the proper voltage and capacity to furnish current for melting purposes.
4. Connecting generators direct to the line.
5. Connecting generators to the line through step-up transformers.

All of these methods have been used successfully by operating companies of the Niagara Hudson System.

The first two methods have been useful only in preventing the formation of ice. The maximum obtainable currents have been insufficient to remove ice formations. The third method has the disadvantage of being inflexible so far as varying the voltage and current is concerned. Methods four and five permit of easy control of voltage and current by varying the generator fields, but the fourth method suffers from the dis-

advantage of being usable only within a restricted area, on account of machine voltage limitations. The impedance to neutral per mile of transmission lines at 60 cycles is very nearly constant due to the high ratio between reactance and resistance and approximately 140 three phase volts per 100 line amperes are necessary for every mile of line. With a 13,000 volt machine and 500 amperes required, the length of line from which ice can be melted is less than 19 miles. At Niagara Falls, however, the large generators are 25 cycle machines, and the radius for generator to line direct melting is correspondingly increased.

The fifth method has been used most extensively. Ice has been melted with current from Niagara Falls in cases where short circuits have been applied at points as far distant as Syracuse (172 circuit miles) and Jamestown (101 circuit miles). Where this method is used, a generator and step-up transformer bank are set apart during melting periods, and the line or lines to be freed from ice are taken out of service and connected to the high tension side of the transformer bank. "Sleet" buses are installed at every important transmission station to furnish flexibility in getting melting current to any line radiating from the station.

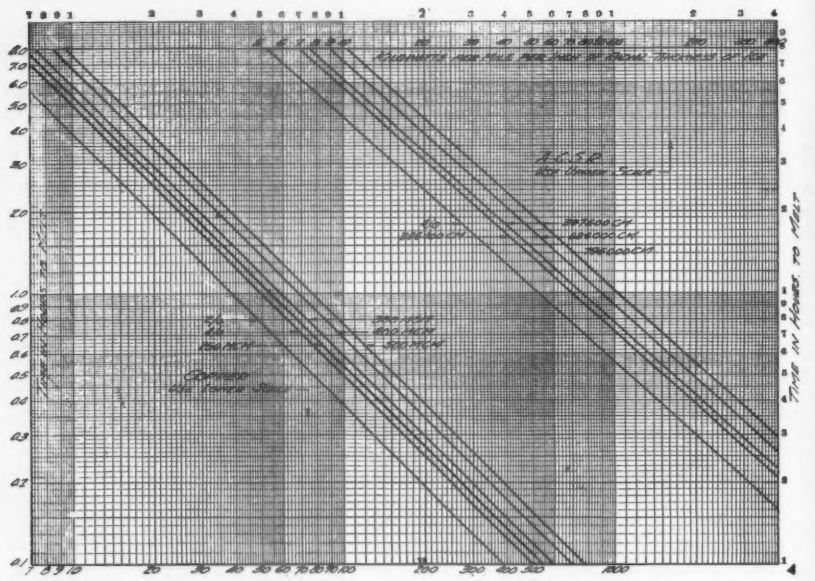


*Fig. 7—Kilowatts per mile per inch of radial thickness of ice*

Every station is supplied with a carefully worked out schedule listing the equipment available for melting purposes, the points at which short circuits are to be applied, the maximum current to be used with any arrangement of circuits, and the reason for setting the limit; that is, whether it is due to maximum permissible equipment voltage, heating limits of conductors, transformers, machines, etc. These limitations result in currents for melting which range from 300 to 1200 amperes, and voltages from 13,000 to 62,000.

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## Handy Annie Had a Busy Year

(*Continued from page* 342)

fore. Cheaper financing and longer term payments are now available.

### Future Big Four

Refrigeration was Annie's first big job for the millions, but it is not her last one.

The ironing machine (over a million in use) has so many advantages and enthusiastic boosters that it is in for a big future—150,000 sold last year; and at least 150,000 water heaters too. These two, plus refrigerators and ranges are the Big Four of the immediate future. Air conditioning next.

Range sales in 1935 nearly were ¼ million; double the year before, and quadruple the year before that. Present day ranges are well nigh perfect. I believe that the range in 1936 is like the refrigerator in 1926—just getting ready to start the brilliant upward climb. Before long, Annie will cook in 10 million homes. By then, she will also be doing so many other jobs in those homes that her wages will be nearer $2 a week than 66c.

If Annie were to get her wages raised to only $1 a week, the returns from the *present* wired homes would be over $1,100,000,000 per year—several Kings' ransoms.

Her work doubled in the last 9 years, and I believe it will double again in the next 5 or 6. Annie is not a temporary "craze" like bicycles, pocket lighters, mahjong, miniature golf, free-wheeling, and jig-saw puzzles! she is here to stay—her prospects of a useful life are everlasting!

Annie cannot use brooms, scrubboards, ice boxes, etc. Millions will discard such old tools of past ages that make them work so hard, and will hire Annie. When provided with all her own kind of tools—beautiful electrical appliances—Annie will glorify their homes. People will live better at less cost.

Within 10 years, millions will learn (what I have found out): That when you give Annie all the tools she wants, she will do seven times as much work for you before here meager wages are tripled. Seven times one equals three in Annie's thrifty and generous arithmetic. And then, for each dollar she gets, she will save two.

Besides being an economist, Annie is also a sociologist of a high order. Parents are wondering these days if there is any connection between the "Flaming youth" of yesterday, and the youthful crime of today. The answer? Annie can make our homes more comfortable, more healthful and more interesting places in which to live *and play*.

Annie promotes beauty, order, and leisure; so our children will patronize their own firesides and develop good taste, culture, and love of home. That is a far richer heritage than mere money.

# Electric Industry Application to F.C.C. for Certain Radio Frequencies

AT ITS St. Louis meeting on June 2, 1936, the Operating Committee of the Edison Electric Institute appointed a special *delegation, authorized to represent the Institute at the informal hearing of the Federal Communications Commission at Washington, D. C., beginning June 15, and to present the subject application to the Commission.

The purpose of the hearing, as stated in the Commission's Announcement No. 16741, Docket No. 3929, was as follows:

(1) Determining the present and future needs of the various classes of services for frequencies above 30,000 kc, with the view of ultimately allocating such frequencies to services;

(2) Securing for the public and the Commission a keener insight into the conflicting problems which confront the industry and the regulatory body in the application of the new frequencies to the service of the public;

(3) Guiding experimentation along more definite lines as may be justified from the evidence presented at the hearing;

(4) Reviewing present frequency allocations to services in the radio spectrum below 30,000 kc, and

(5) Assisting the Government in its preparation for the International Telecommunications Conference at Cairo in 1938.

The E.E.I. special delegation testified before the Commission on June 25. The brief submitted to the Commission as the basis of this testimony is given herein.

In response to the notice of the hearing, upward of 100 firms, persons, trade associations, federations, and Government bureaus presented testimony. There were several times as many applicants for all frequencies at present considered physically usable as there are frequencies. The problem of the Commission, therefore, in making equitable allocation of frequencies is, indeed, a difficult one from a domestic viewpoint. The problem is further complicated by international aspects. It is probable that several months will be required before the Commission can make any definite pronouncements.

It seems unlikely that the Federal Communications Commission will grant any new permits and licenses for the use of radio by our industry until it has reviewed all of the testimony taken at the recent hearing. However, any company interested in making use of radio service as outlined in the brief should proceed to make the necessary studies of its requirements with a view of making application promptly to the Commission for licenses to construct and operate the necessary stations. A number of applications in the hands of the Commission would be convincing evidence of the seriousness of the situation to this industry and evidence of intent to make use of any frequencies allocated. Such application should be confined to the band of frequencies listed in the appended brief.

A great many formalities must be complied with in filing such individual applications, and the Edison Electric Institute general office is prepared to assist in the preparation of such applications.

* E.E.I. delegation to F.C.C. hearing June 15, Washington, D. C.

Messrs. P. H. Chase..... Philadelphia, Pa.
H. W. Eales (Chairman) ..... Chicago, Ill.
Alexander Maxwell .. New York, N. Y.
Philip Sporn ..... New York, N. Y.
*Technical Advisers*
J. O'R. Coleman ..... New York, N. Y.
E. D. Glatzel ..... Detroit, Mich.
G. W. Spaulding..... Baltimore, Md.
G. H. Underhill..... Poughkeepsie, N. Y.

## STATEMENT BEFORE FEDERAL COMMUNICATIONS COMMISSION

Docket No. 3929 June 15, 1936

## APPLICATION OF THE ELECTRIC LIGHT & POWER INDUSTRY FOR THE ALLOCATION OF CERTAIN RADIO FREQUENCIES TO ELECTRIC LIGHT & POWER SERVICE

**By Herbert W. Eales**
*Representing the Edison Electric Institute*

Mr. Chairman, Members of the Federal Communications Commission:

The Edison Electric Institute requests to be heard on behalf of all privately owned electric light and power utilities in the United States, as it is the representative trade association in this industry and its membership represents about three-quarters of the industry. My following statements will be confined to the first group of the topical list of informatory requirements included in the Commission's notice of hearing. The technical phases of our application will be presented by Mr. Glatzel of Detroit and Mr. Underhill of Poughkeepsie.

Specifically, the industry requests frequency allocations for three uses to aid in the rendering of its service to the public.

1. Point to point—Emergency Service
2. Point to point—System Operation
3. Between point and mobile—Trouble Dispatching

### Evaluation of Services from the Standpoint of *Public Need and Benefit*

The frequencies requested to be allocated to electric utility service are required in the interest of the general public and particularly of the twenty-five million subscribers and approximately ninety million users of electric service in the United States, for their safety and convenience.

The rapid development and expansion of our service have brought with them an increasing public demand for improved continuity. The difficulties of meeting the ever increasing demand are multiplied manyfold in the less populous areas where thousands of miles of rural distribution lines have recently extended the territory covered by utility service far beyond the limits of a few years ago.

The modern home with its electric light, its electrically controlled heat, its electrically pumped water supply, its electric cooking and its electric food preservation is rapidly becoming as dependent upon electric service as are industry and commerce. An interruption in this service completely disrupts normal family life and if of extended duration may constitute a serious menace to the health and welfare of the people affected.

The avoidance of lengthy interruptions, particularly to the remotely located customers, is difficult and costly, not alone in dollars, but as well in the time element involved in covering these widespread areas.

As an aid in the establishment and maintenance of the high character of service demanded by modern public needs, the public utility industry has developed and has in use complex communication systems. The ordinary business of the industry, which may be transacted through inter or intra office contacts, is at present conducted by means of ordinary telephone, telegraph or power line carrier current circuits. Certain emergency substitutes for these forms of communication are partially provided for by the existing radio frequency channels of 2726 Kc. and 3190 Kc.—although their actual usefulness is greatly restricted, both because of limited daylight range characteristics and because of severe limitations placed upon them as emergency channels.

In marked contradistinction to present wire provisions for the conduct of the routine office business of these utilities, those facilities now technically available in the radio art for direct communication with mobile units are not at present permitted to them. These radio facilities are sorely needed to aid and expedite the prompt repair of all defective conditions which occur on widespread electric lines and which may seriously affect consumers and the public.

Some of the many situations, where the limitations of wire facilities are apparent and where radio communication can be most

effective in the direct service of consumers and public for their conveniences and safety, are briefly as follows:

As previously stated the continuity of electric service is of prime importance to all users of electricity. Interruptions to this service, even although brief with respect to time and local in extent, may easily produce formidable emergencies for the public concerned, although many situations could hardly be characterized as major emergencies for the utilities themselves. Such situations, for example, comprise the interruption of service to elevators in tall buildings, to fire pumps, to motive power in manufacturing establishments, to ventilating equipment, to the interruption of power in hospitals or schools, water pumping stations, theatres or other places of public assembly.

Our industry likewise has an obligation to the many other general public service agencies who are themselves dependent on continuous electric supply for their own public functions and services.

Further, the utilities own plant equipment such as overhead lines situated in the public highways or in places accessible to the public which suffer mechanical damage as by wind or sleet, falling trees or other objects, conflagrations, earthquakes, and from traffic accidents such as those occasionally caused by automotive vehicles running into and breaking down poles or towers. Such occurrences, which are beyond the control of the utility, frequently result in conditions due to fallen wires, or broken poles or cross-arms which constitute definite hazards to the general public. Every prudent consideration demands that such conditions be corrected with a minimum delay, a matter not of hours but of minutes.

In like manner, the wiring equipment and apparatus in consumers' premises is subject to disorders due to accidents or carelessness, which may readily result in fire or personal accident if not promptly corrected. Although such equipment is not utility property, the utility is invariably called to clear the equipment from the lines and restore the remainder of the service. This is a particularly important service because of the possibility of hazard.

In addition to these routine day-to-day situations there occur from time to time extensive disasters due to flood, storm or fire, when major parts of entire electric systems may be incapacitated. Notable examples have been furnished during the past year by the extraordinary floods in New England and Pennsylvania and by extensive sleet storms and tornadoes in the south, whereby large sections of power supply systems furnishing service to hundreds of thousands of consumers have been incapacitated and where at the same time and for the same reasons ordinary means of communication were also incapacitated when most needed. However, impressive as such disasters may be, they do not establish the full measure of extraordinary occurrences. The same effects are likely to be produced by the forces of nature at any time, and in fact are frequently occurring in one degree or another, invariably with the characteristic accompaniment of the interruptions of ordinary means of communication. In such situations, space radio provides the sole means for the communication obviously essential for prompt restoration of service.

The Edison Electric Institute has detailed records from many companies describing the time and extent of disruption of all normal means of communication which occurred during flood disasters in March, 1936, on the systems of the Duquesne Light Company, West Penn Power Company, and the Pennsylvania Power & Light Company; during sleet storms in Western New York State, March, 1936; in Minnesota, March, 1935; in Pennsylvania, March, 1932, February, 1934, and February, 1936.

The harrowing story of these disasters is so well known that any detailed review of them, or of the many specific instances connected therewith, in order to emphasize the needs for radio communications facilities by the utilities involved, is unnecessary. This widespread distress which accompanied the 1935-36 disasters has served to emphasize to the industry the need for substantially unrestricted use of radio for power system operation and trouble dispatching.

It is at this point pertinent to point out the similarity between the facilities requested for the Electric Light and Power Industry, and those utilized in police service, and at the same time to discuss the reasons why "special emergency" limitations or any burdensome restrictions defining what emergencies are, should not be applied to frequencies allocated to the Electric Light and Power Industry. With the power companies as with the police, promptness is of maximum and often vital importance. In both cases there is usually no way to determine whether or not a service call represents an actual emergency and in both cases it is equally true that every call, even of the simplest nature, contains the potentialities of an emergency. Both are devoted to the purpose of rendering prompt services to the public in cases where the public cannot help itself. It may be pointed out also that in the service rendered by fire departments experience indicates that in spite of the expense involved in turning out a large amount of fire apparatus for some trifling cause, the practice is a good one in the service of the public because nearly all fires are trifling fires if they are dealt with promptly, and because no one can predict at the moment of alarm what the ultimate consequences may be.

As regards point-to-point allocations there is a definite need in certain situations for such service on both the medium and ultra high frequencies requested. These situations are, first, those where local topographical conditions preclude the establishment or maintenance of wire circuits on an economic or physical basis even approaching minimum reliability requirements; secondly, where point to mobile equipment has been established at two or more points, permissible communication between the fixed points is highly desirable for relay purposes; and thirdly, where a communication service supplementary to existing means is sorely needed, but where it may be difficult to justify the expenditure for radio equipment if its use is to be restricted to special emergencies as at present defined by the Commission.

To sum up the foregoing considerations, therefore, it may be said that both for the purpose of point-to-point communication and for the purposes of communication with mobile repair crews or other service agencies, adequate means of radio communication are required in the direct interest of the convenience and safety of the public.

With respect to the probability of the practical establishment of the service requested, it may be said that on the basis of your approval of this application, some thirty companies with wide geographical distribution, serving 6,500,000 customers, have already signified in writing their intention to establish radio communication.

With respect to the Commission's inquiry as to the degree of public support likely to be received and the extent to which the proposed services would be available to the public, it is respectfully pointed out that although all of the facilities proposed are in the direct service of the public, there will be no direct contact of the public with them. In this respect the services proposed are comparable to those now extensively used in police radio systems and similar services devoted to the convenience and safety of the public without direct participation by the public. Moreover, there will be no direct financial revenue to the electric light and power industry as a consequence of the use of space radio as contemplated. It is intended to supplement and not replace other forms of communication in order to better meet the ever increasing demands being placed upon electric service by the public.

### Summary

We believe the request of the electric light and power industry for radio frequency allocations represents a real and pressing need in the interest of the public safety and convenience. To fulfill that need we propose:

1. That the special emergency frequency allocations of 2726 kilocycles for telephony and 3190 kilocycles for telegraph as now provided in the existing regulations be retained, but that the maximum power limitation be increased to 1000 watts. That under the special emergency classification, two additional frequencies be assigned in the band 4500—6000 Kc., to provide daytime frequencies to supplement the present telephone and telegraph frequencies which have been found suitable mainly for nighttime operation. That the test period be extended from the present maximum limitation of two hours per week to at least four hours per week and that during these test periods there be permitted the handling of operating messages and messages simulating those to be handled in an emergency.
2. That allocations be made for "public utility power dispatching service" for point-to-point communication, for use in load dispatching and system operation.
3. That frequency allocations be made for between point and mobile service, for use in trouble dispatching, including such items as repairs to transmission lines, urban distribution circuits, rural lines, etc.

For the second and third proposal, separately and collectively, we request that frequencies be made available as follows:

(a) Four frequencies in the band 2.5 to 3.0 megacycles
(b) Two frequencies in the band 4.5 to 6.0 megacycles
(c) Four frequencies in the band 30 to 42 megacycles
(d) Two frequencies in the band 45 to 60 megacycles
(e) Four frequencies in the band 100 to 200 megacycles.

These requests total sixteen new allocations for public utility use, plus two additional "special emergency" allocations and the retention of the two allocations at present available on the "special emergency" basis. Of the new requests, ten are in the band between 30 and 200 megacycles, representing some 1½ per cent of the available frequencies (0.3 per cent separation basis) in that band. It is our belief:

1. That we have shown beyond any reasonable doubt that the service desired is in the truest sense for the safety, benefit and convenience of the entire population of the United States.
2. That for a service as widespread and essential to the nation's welfare and existence, as is the electric light and power industry, the number of allocations requested are very moderate indeed.

# TECHNICAL TESTIMONY ON MOBILE SERVICE IN CONNECTION WITH APPLICATION OF ELECTRIC LIGHT AND POWER INDUSTRY FOR ALLOCATIONS IN THE RADIO FREQUENCY SPECTRUM

*Presented by*

**G. H. Underhill**

*of Poughkeepsie, New York*

*Representing the*
*Edison Electric Institute*

Mr. Chairman, gentlemen of the Federal Communications Commission,

Mr. Eales has presented the general needs and desires of the Electric Light and Power Industry for allocations of frequencies in several portions of the radio spectrum and Mr. Glatzel has presented some of the technical considerations involved in the special emergency and fixed point to point services requested.

It is my purpose to elaborate upon some of the technical phases of our application for a communication service between fixed and mobile units. In general I shall follow the outline given in the Commission's notice of hearing. A number of the questions propounded therein concern factors which are fundamentally the concern of the radio manufacturers and the developmental laboratories and on such questions it would be presumptuous on my part to present other than a qualitative opinion, based partly upon the results of experimental work which certain electric utility companies have conducted during the past few years under experimental licenses from the Commission.

In connection with such experimental work it is suggested that the practicability of all but the highest group of frequencies considered for the desired service have been sufficiently proven and that the electric light and power industry is not interested in developing space radio experimentally. Its sole objective is the use of space radio as a reliable means of communication.

## Frequencies Required

The Electric Light and Power Industry has carefully reviewed its needs and the frequencies requested are felt to be its minimum requirements. It has no desire to complicate the difficult task of the Commission by expecting it to determine the percentage of reasonableness contained in a request for an unduly large number of allocations.

The 16 frequencies we request for service between point and mobile units are the same as those desired for point to point service and are as follows:

(a) Four frequencies in the band between 2500 and 3000 kc.
(b) Two frequencies in the band between 4500 and 6000 kc.
(c) Four frequencies in the band between 30 and 42 mc.
(d) Two frequencies in the band between 45 and 60 mc.
(e) Four frequencies in the band between 100 and 200 mc.

A1, A2 and A3 emission is requested on all frequencies.

These portions of the spectrum have been selected in the light of present-day knowledge, as being those best suited to the services involved. The exact position of individual frequencies within the limits stated appears relatively immaterial. From a purely technical standpoint it seems desirable that the individual frequencies within any one portion be allocated as a group of adjacent channels. This applies more particularly to the ultra high frequency portions where such a process would be conducive to frequency conservation and the minimization of interference with adjacent services and also may provide for at least partial future expansion of allocations as needed, through technological development, without disturbing the position or extent of the initially created band. If the requested frequencies should be allocated as bands, the electric light and power industry stands ready to assist the Commission in the policing of such bands through the geographical and time coordination of individual frequency assignments.

In this connection we desire to point out that we have considered the possibility of cooperative utilization of existing facilities controlled by other services. The disadvantages inherent in any scheme involving either the cooperative use of channels or the relaying of public utility trouble dispatches through other radio agencies of whatever character appear to prohibit its adoption, generally. While in certain isolated instances such relaying might be advantageously utilized to provide a local community with improved utility service not otherwise obtainable, the plan would be totally unsatisfactory on a nation-wide basis and would not result in the conservation of frequencies.

Aside from the legal questions of public obligation and divided responsibility there are salient technical and operating objections. Where transmitters capable of providing such alternate service might exist, they would frequently be of insufficient power and either unsuited by location to provide a coverage suitable for utility operations or so remote from utility dispatching centers that contact would be unduly delayed or expensive. Furthermore, utility operations often embrace several municipalities and with individual local frequencies the problem of multiband mobile receiver operation in utility trucks would preclude satisfactory utility service.

The practical operating difficulties of such relaying would be most serious. Specifically the factors giving rise to these difficulties include, for example, message congestion and delay, priority determination and errors in dispatching because of unfamiliar terminology.

Therefore, the industry is opposed to such relay or cooperative operation.

Since A1, A2 and A3 emission is requested for all frequencies the required separation between individual frequencies in the medium wave bands is greater than would be required for A1 alone. On the higher frequencies, apparatus limitations rather than side band width appear to dictate the separation. We believe therefore that the following values should be observed for the present:

| *Frequency* | *Separation* |
|---|---|
| 2500-3000 kc. | 8 kc. |
| 4500-6000 kc. | 15 kc. |
| 30.0-42.0 mc. | 100 kc. |
| 45.0-60.0 mc. | 150 kc. |
| 100.0-200.0 mc. | 500 kc. (Approximately) |

These values contemplate that stations in different services but geographically coincident will not operate on adjacent channels, a condition which may be met with proper coordination.

In effect these separations applied to the number of frequencies requested result in the following bands:

| *Spectrum Section* | *Band Width* |
|---|---|
| 2500-3000 kc. | 32 kc. |
| 4500-6000 kc. | 30 kc. |
| 30.0-42.0 mc. | 400 kc. |
| 45.0-60.0 mc. | 300 kc. |
| 100.0-200.0 mc. | 2000 kc. (Approximately) |

## Frequency Characteristics and Range

Although there are known to be many important exceptions, it is believed that the range requirements of the Electric Light and Power Industry for service between point and mobile units will normally be limited to less than 50 miles.

The medium frequency allocations requested would be limited to fixed transmitters and to such locations where distances or terrain would prohibit satisfactory use of the ultra high frequencies. In most instances the frequencies in the 2500-3000 kc. band would serve to alternate with those in the 4500-6000 kc. band on a night and day basis, respectively.

The frequencies above 30 mc. would be used for all mobile and portable work and for all fixed station use where local conditions would permit satisfactory shorter range communication.

These requirements agree with recognized propagation characteristics and the reliable range limits of the respective frequencies and are further dictated by physical limitations of the antenna structures required.

## Field Intensities

Absolute field intensity values required for reliable service cannot be definitely stated independently of relative noise levels. While commercial receivers now available for all frequencies requested up to 60 mc. will reach well below usual noise levels, it is believed that the requirements of mobile reception call for receiver inputs of approximately 10 microvolts in the ultra high range and of approximately 150 microvolts in the medium frequency range, if reliable commercial operation is to be maintained.

## Interference

If the requested channel separations are adhered to, modern receivers are capable of reducing inter-channel interference to a negligible minimum. Serious interference (particularly on the 2500-6000 kc. band) may, however, result if many relatively high powered transmitters are operated on a shared channel basis. In any case the problem of radio interference is considered to be secondary to that of electrical interference. Serious interference will undoubtedly be encountered both from atmospherics and from electrical devices (principally automotive ignition systems). While receiver developments are available which, at least on the ultra high frequencies, can appreciably reduce the overall effect of electrical disturb-

ances the problem is a very serious one in mobile receiver application.

Approximate anticipated average values of noise levels are roughly as follows:

*2500-6000 kc.*

| | |
|---|---|
| Urban | 10 microvolts per meter |
| Rural | 3 microvolts per meter |

*30-42 mc.*

| | |
|---|---|
| Urban | 30 microvolts per meter |
| Rural | 5 microvolts per meter |

Expressing noise tolerance as a signal to noise ratio, data are available which indicate that commercial understandability requires an audio output ratio of approximately 8 to 1, while 4 to 1 is approximately the lower limit of intelligibility.

### Apparatus Limitations

Most of the questions propounded by the Commission under this heading fall outside the scope of discussion proper to a prospective user of commercial radio apparatus.

For this reason we merely state that both transmitting and receiving apparatus of adequate selectivity and of proven stability and reliability are now available for all frequencies requested except those above 60 mc. and we understand that apparatus in the 100-200 mc. group can be made available upon demand.

As for transmitted frequency tolerances it is our belief that the present limits might well be narrowed to a value of the order of ±.02 per cent for all fixed transmitters and ±.04 per cent for all mobile and portable transmitters operating at frequencies of 60 mc. and lower. Above 100 mc. we believe frequency tolerances should be slightly more liberal until such time as refinements are commercially practicable.

In this connection it is pertinent to point out that the industry contemplates the use of both transmitting and receiving equipment of the highest commercial grade (for instance, mobile receivers as described by Mr. Nelson of the Bell Telephone Laboratories under his Case I). It does not, however, wish to be subjected to uneconomic conditions as a result of frequency tolerance specifications forcing the use of what might be termed laboratory equipment into field use.

Antenna designs for the lower group of frequencies have been well established both for generally circular field patterns and special directional service. For the higher frequencies requested, vertical half and three-quarter wave structures, both directional and non-directional and with several types of feed are available. In this connection it is the intention of the Electric Light and Power Industry to closely watch the technical development of antennas with particular reference to both horizontal and vertical directive arrays and to utilize to the utmost practical extent this means of securing the most efficient distribution of the radiated energy.

The industry is adequately supplied with trained technicians thoroughly capable of maintaining all equipment at peak efficiency and at all times strictly within such transmitter frequency tolerances as may be specified by the Commission.

## TECHNICAL TESTIMONY ON FIXED SERVICES IN CONNECTION WITH APPLICATION OF ELECTRIC LIGHT AND POWER INDUSTRY FOR FREQUENCY ALLOCATIONS AND REQUESTED CHANGES IN REGULATIONS

*Presented by*

**E. D. Glatzel**
*of Detroit,*

*Representing the Edison Electric Institute*

Mr. Chairman, gentlemen of the Federal Communications Commission:

Several years ago the Commission made special emergency assignments of 2726 kc. and 3190 kc., which assignments are available to the electric light and power companies and other interests. Because of the stringent restrictions relative to the use of these frequencies as covered by rules 340, 341 and 342, only a few electric light and power companies have been able to take advantage of the availability of these channels. This has been due to the following principal reasons:

(1) With the power limitations imposed under rule 342 it is impossible in many cases to cover the required distances under daytime conditions on the frequencies assigned.

(2) The limitation of operating time for test purposes of two hours per week under rule 340 makes it most difficult to maintain operating personnel sufficiently trained in actual operation to render instant and effective service in case of a real emergency. In this connection it is a well-known principle of radio operating practice that a communication circuit functions more reliably if it be kept in frequent operation.

(3) In view of the limited communication service obtainable under existing restrictions, the industry with a few exceptions has been unable to economically justify the comparatively large expenditure for purely emergency radio facilities. In other words, the industry generally has found it difficult to justify the expenditure of large sums for equipment whose use is limited to practically zero per cent useful load factor and to only one class of the many emergencies where radio is most effective.

The electric light and power industry feels that additional facilities should be made available and that certain changes must be made in existing regulations in order to provide a radio service to our industry that will have sufficient utility to warrant its general use.

We propose:

*First:* That in the special emergency classification, day frequencies as well as night frequencies be provided. We request assignments of two frequencies within the band of 4500 to 6000 kc., one of them to be used as a day-time telephone frequency to supplement the present 2726 kc. assignment and the other, a day-time telegraph frequency to supplement the present 3190 kc. assignment. It will be understood, of course, that all four of these frequencies will be suitable for both day and night services under certain conditions, and it is therefore requested that no day or night designation be applied.

*Second:* That rule 342 be amended to provide a maximum power of 1000 watts rather than 500 watts. Many electric utility companies require radio transmission over distances well in excess of 50 miles. Transmission data collected over a period of years by several of our companies indicate that under the adverse conditions usually encountered during an emergency, a power of at least 1000 watts is necessary to provide reliable communication.

*Third:* That rule 340 be amended to permit test operation of at least four hours weekly and that the handling of operating messages simulating those to be handled in an actual emergency be permitted. This recommendation is made to permit our operators to become more proficient in the handling of our emergency communications.

*Fourth:* That the following frequencies be allocated for both point to point service and for service between fixed points and mobile units for the purposes of system operation and trouble dispatching.

Four frequencies in the 2500 to 3000 kc. band
Two frequencies in the 4500 to 6000 kc. band
Four frequencies in the 30 mc. to 42 mc. band
Two frequencies in the 45 mc. to 60 mc. band
Four frequencies in the 100 mc. to 200 mc. band.

The allowable transmitter power output for the medium high frequency channels should be sufficient to cover distances which in certain cases may be as great as 300 miles. Types A1, A2 and A3 emissions are desired with no restrictions as to hours of operation.

We are suggesting common use of these frequencies for fixed and mobile service, with a view not only of conserving frequencies but of providing a more flexible system of operation.

The allocations requested have been determined from a consideration of the propagation characteristics of these frequencies, the geographical location and extent of territory served by individual companies, and the estimated probable uses of such assignments in the immediate future.

The number of allocations requested is a moderate estimate covering requirements of the present and immediate future. With growth of the industry or any further increase in importance of electric light and power service to the public, additional allocations may be necessary.

The location of the requested frequencies in the spectrum has been determined by tests conducted by member companies and by consultation with the outstanding equipment manufacturers and laboratories in this country.

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## A Note on Accounting

(*Continued from page* 336)

are cleared periodically or progressively against all completed units of property (as in Method 4). The basis for clearing is the estimated cost of the completed units. Since the charges for any individual layout cannot be identified, the control feature of Method 4 is lacking. Under this method, the uncleared balance of expenditures on work in progress becomes the gauge for determining whether the estimated unit costs used for clearing purposes are too high or too low. This method represents the ultimate in economy, and is suitable for such accounts as meter installations and services.

# Impulse and 60 Cycle Flashover of Rod Gaps and Insulators*

THE MATERIAL contained in the report submitted by the NEMA Group at the Cleveland meeting in April, 1934, has been reviewed in the light of additional data, and a revised and supplementary report is submitted. This represents the results of cooperative work of the Laboratories of Allis Chalmers, General Electric, Locke, Ohio Brass, and Westinghouse.

### Test Conditions

*Impulse Tests*

(a) *Wave Form*

The data interchanged among the laboratories was taken with 1x5 and 1.5x40 waves, positive polarity, the first number denoting the time in microseconds from the virtual time zero to crest voltage, and the second denoting the time from zero to half value on the tail. The data represents minimum impulse flashover values on the tail of the wave.

(b) *Virtual Time Zero*

The virtual time zero is found as follows. Determine points on the front of the wave at 10 per cent and 90 per cent of the crest value. Draw a straight line through these points and the intersection of this line with the zero voltage line is the virtual time zero.

(c) *Standards and Measurement*

The equipment and methods for producing and measuring impulse voltage are different in the several laboratories. Each group has developed its own calibration and corrections. The subject of impulse testing measurements is to be given further study by an AIEE committee.

*60 Cycle Tests*

All the 60 cycle tests were made in accordance with the rules of the AIEE.

*Sphere Gap Curves*

Whenever sphere gaps were used for voltage measurement the revised calibration curves of Meador and Bellaschi were used. The flashover values tabulated in this report are based on the sphere gap calibrations given in the report of the AIEE Subcommittee of the Instruments and Measurements Committee of the Institute.

* Progress Report of Joint N.E.M.A.-E.E.I. Coordination Committee, N.E.M.A. Group Subcommittee on Correlation of Laboratory Data.

### Accuracy

*Impulse Tests*

The individual test points from which the curves were obtained in any specific laboratory were within plus or minus 5 per cent of the average curve of that laboratory. The average curves of the several laboratories from which the final averages were obtained had a spread of less than 5 per cent. This statement applies to both the 1x5 and 1.5x40 microsecond waves.

TABLE I—IMPULSE VOLTAGE FLASHOVER, POSITIVE WAVE, SUSPENSION INSULATORS, 10-INCH DIAMETER, 5¾-INCH SPACING

Barometer, 30 in.; Temp., 77° F.; Humidity, 0.6085 in. Vapor Pressure. Data from Allis Chalmers, General Electric, Locke, Ohio Brass, and Westinghouse Laboratories averaged.

| | Minimum Impulse Flashover Voltage in Kv. | |
|---|---|---|
| *No. of Units* | *1x5 ms. Wave* | *1.5x40 ms. Wave* |
| 1 | 155 | 150 |
| 2 | 285 | 255 |
| 3 | 395 | 355 |
| 4 | 500 | 440 |
| 5 | 610 | 525 |
| 6 | 715 | 610 |
| 7 | 820 | 695 |
| 8 | 930 | 780 |
| 9 | 1,040 | 860 |
| 10 | 1,145 | 945 |
| 11 | 1,250 | 1,025 |
| 12 | 1,355 | 1,105 |
| 13 | 1,460 | 1,185 |
| 14 | 1,565 | 1,265 |
| 15 | 1,670 | 1,345 |
| 16 | 1,775 | 1,425 |
| 17 | 1,880 | 1,505 |
| 18 | 1,985 | 1,585 |
| 19 | 2,090 | 1,665 |
| 20 | 2,200 | 1,745 |

TOLERANCES

These values represent average results of tests on suspension line insulators of different design and manufacture made in different laboratories. When tests are made in any particular laboratory upon an insulator unit or assembly of specific design and manufacture, the flashover should be within plus or minus 8 per cent of the value given in the tabulation.

In accordance with AIEE Standards No. 41, the comparison should be made on the basis of the average flashover obtained from tests on three (3) separate insulator units or assemblies.

*60 Cycle Tests*

The individual test points from which the curves were obtained in any one laboratory were within plus or minus 5 per cent of the average curves of that laboratory. The average curves of the several laboratories from which the final averages were obtained had a spread of less than 5 per cent.

On this basis it may be expected that individual points obtained in any laboratory should be within plus or minus 8 per cent of the average curve, for both impulse and 60 cycle flashover tests.

### Test Results

The average results agreed upon for insulators and rod gaps are given in the accompanying tables. These values, in the opinion of the committee, are of sufficient

TABLE II—IMPULSE VOLTAGE FLASHOVER POSITIVE WAVE ROD GAP

Barometer, 30 in.; Temp., 77° F.; Humidity, 0.6085 in. Vapor Pressure. Data from Allis Chalmers, General Electric, Locke, Ohio Brass, and Westinghouse Laboratories averaged.

| | Minimum Impulse Flashover Voltage in Kv. | |
|---|---|---|
| *Gap Spacing Inches* | *1x5 ms. Wave* | *1.5x50 ms. Wave* |
| 0.5 | 22 | 22 |
| 0.75 | 30 | 30 |
| 1.0 | 38 | 38 |
| 1.5 | 51 | 51 |
| 2 | 60 | 60 |
| 3 | 76 | 75 |
| 4 | 97 | 91–95* |
| 5 | 120 | 106–114 |
| 6 | 143 | 128–141 |
| 7 | ... | 141–155 |
| 8 | 187 | 159–166 |
| 9 | ... | 175–178 |
| 10 | 233 | 190 |
| 15 | 340 | 275 |
| 20 | 440 | 350 |
| 30 | 640 | 505 |
| 40 | 835 | 650 |
| 50 | 1,035 | 800 |
| 60 | 1,230 | 945 |
| 70 | 1,425 | 1,095 |
| 80 | 1,620 | 1,240 |
| 90 | 1,815 | 1,385 |
| 100 | 2,010 | 1,530 |

* Dual values are due to unstable conditions, the cause not being known.

TOLERANCES

These values represent average results of tests made in different laboratories. When tests are made in any particular laboratory using the rod gap as a basis of comparison the flashover voltage shall be taken from the above tabulation and shall be considered as correct within plus or minus 8 per cent.

accuracy to warrant their use for coordination purposes and should be used until such time as sufficient additional data are obtained to confirm or modify them.

TABLE III—60 CYCLE VOLTAGE FLASHOVER, SUSPENSION INSULATORS, 10 INCHES DIAMETER, 5¾-INCH SPACING AND ROD GAPS

Barometer, 30 in.; Temp., 77° F.; Humidity, 0.6085 in. Vapor Pressure. Data from Allis Chalmers, General Electric, Locke, Ohio Brass, and Westinghouse Laboratories averaged.

| *Suspension Insulators* | | *Rod Gaps* | |
|---|---|---|---|
| *No. of Units* | *Flashover Voltage in Kv. 60 Cycle Effective* | *Gap Spacing Inches* | *Flashover Voltage in Kv. 60 Cycle Effective* |
| 1 | 80 | 0.5 | 10 |
| 2 | 155 | 0.75 | 15 |
| 3 | 215 | 1 | 19 |
| 4 | 270 | 1.5 | 27 |
| 5 | 325 | 2 | 33 |
| 6 | 380 | 3 | 45 |
| 7 | 435 | 4 | 55 |
| 8 | 485 | 5 | 64 |
| 9 | 540 | 6 | 72 |
| 10 | 590 | 8 | 89 |
| 11 | 640 | 10 | 105 |
| 12 | 690 | 15 | 150 |
| 13 | 735 | 20 | 200 |
| 14 | 785 | 30 | 295 |
| 15 | 830 | 40 | 385 |
| 16 | 875 | 50 | 480 |
| 17 | 920 | 60 | 575 |
| 18 | 965 | 70 | 665 |
| | | 80 | 755 |
| | | 90 | 835 |

TOLERANCES

*Suspension Insulators*

These values represent average results of tests on suspension line insulators of different design and manufacture made in different laboratories. When tests are made in any particular laboratory upon an insulator unit or assembly of specific design or manufacture, the flashover should be within plus or minus 8 per cent of the value given in the tabulation.

In accordance with AIEE Standards No. 41, the comparison should be made on the basis of the average flashover obtained from tests on three (3) separate insulator units or assemblies.

*Rod Gaps*

These values represent the result of tests on rod gaps made in different laboratories. When tests are made in any particular laboratory using the rod gap as a basis of comparison, the flashover voltage shall be taken from the above tabulation and shall be considered as correct within plus or minus 8 per cent.

It should be noted that the sphere gap is the standard for voltage measurements and that the rod gap is to be used only when approximate results will be satisfactory.

# Meeting of the Joint Subcommittee on Development and Research

THE Joint Subcommittee on Development and Research met with its Project Committees in the General Office of the Edison Electric Institute on June 11, with Mr. Davidson presiding. The various Project Committees presented Progress Reports covering the work of the last six months, and discussing plans for the immediate future. In addition, five Technical Reports were presented.

*Project Committee 1A—Noise Induction* presented a Technical Report entitled "The Use of Power and Telephone Transpositions Within Exposure Sections." This report contains a discussion of the principles of the application of power and telephone transpositions to reduce noise induction in exposed sections, together with summarized test results obtained in a limited number of exposures, involving various combinations of power and telephone transpositions. In three exposures specially selected for test purposes it was possible to change the transpositions so that the effect of different transposition arrangements might be compared directly.

In two appendices are given a description of Bell System transposition systems and an outline of methods for designing layouts of coordinated transpositions.

*Project Committee 1B—Noise Evaluation* presented on behalf of former Project Committee No. 7 a report of the work of that committee dealing with power level and sensitivity of telephone circuits. Reviewing the changes which have taken place in the exchange plants during the last two decades this report points out that in the early part of the period there was an important trend toward more uniform efficiency among telephone sets and loops so that the spread between the weakest and strongest stations was considerably reduced, although the efficiency of the strongest stations was not materially increased. Recent trends have been toward instruments of more uniform response with frequency without sacrifice in the average efficiency over the important voice range. These developments lead to instruments which will transmit speech more clearly and effectively. The trend toward improved balance of party line subscriber sets and some of the central office equipment makes possible substantial increases in the ratio of telephone power levels to noise levels in the exchange plant.

In the toll plant the trend has been toward higher levels on voice-frequency open-wire circuits. On such circuits the levels have been improved something like 10db since the advent of telephone repeaters. On open-wire carrier circuits the transmitting levels have been pushed considerably higher. Carrier systems as now operated on open-wire lines also represent a considerable advance in reduction of susceptiveness to noise. In repeated cable circuits there has been little urge from the noise standpoint toward using high levels since such circuits are so well balanced and shielded that noise from outside power induction is not ordinarily a matter of much concern. On cable circuits, repeaters are used which are comparable in speech carrying capacity to those used on open-wire circuits. In general, the transmission levels on the shorter two-wire cable circuits are not held as high as they are on voice-frequency open-wire circuits. On the longer voice-frequency cable circuits the levels are somewhat higher than on open-wire circuits. Voice-frequency cable systems thus operated represent a considerable advance over voice-frequency open-wire circuits in the matter of noise susceptiveness.

*Project Committee 1C—Wave Shape* presented a Technical Report entitled "Inductive Influence of 13 Kv Four-Wire Rural Distribution Circuits—Interim Report." This report is described elsewhere in this issue of the Bulletin under the heading "Inductive Coordination Aspects of Rural Electrification."

*Project Committee 2D—Specific Devices* presented for the information of the Joint Subcommittee a Special Technical Report entitled "Design of Short-Circuiting Relay Protector Installations." In designing an installation of short-circuiting relay protectors to limit the voltage-to-ground from induction to a desired value a proper relationship must be maintained between spacing of protectors, protector ground resistance, and circuit impedances. The object of this report is to give an engineering method whereby the details of such an installation may be worked out in advance to meet predetermined performance characteristics.

*Project Committee 2J—Low Frequency Residuals* presented a Technical Report entitled "Computation of Zero-Sequence Impedances of Power Lines

and Cables." This report is a revision of Provisional Report No. 3, issued under date of May 14, 1931. In the report, formulas are developed for computing zero-sequence impedance and ground-wire or sheath currents of power lines and cables. Formulas are expressed in terms of the self and mutual impedances of conductors treated as ground-return circuits. Charts showing the self and mutual impedance of conductors with ground return, and tables of conductor resistances are provided to facilitate computations. Comparisons between computed and experimental values of zero-sequence impedance and ground-wire currents are made for several different lines. A method of computing zero-sequence capacitance of power lines is also included.

The principal differences between this and the original report consist in the addition of a new section dealing with the zero-sequence capacitance of power lines and the addition of two Appendices relating, respectively, to the zero-sequence impedance of lines with finite leakance between ground wires and ground, and to the zero-sequence impedance of cables containing magnetic material. A simplification of the method of determining the zero-sequence impedance and distribution of fault current in the case of a fault within a twin-circuit section of a power line has also been made.

The reports of Project Committees 1A, 2J and 7 have been recommended for issuance as Engineering Reports. Announcement will be made in the Bulletin when these recommendations are acted upon by the Joint Committee on Plant Coordination. The report of Project Committee 1C has already been approved as Provisional Report No. 18 and is now available for distribution.

# Inductive Coordination Aspects of Rural Electrification

IN recent years the expansion of rural electrification has directed greater attention to the inductive coordination of power distribution and exchange telephone systems at noise frequencies in rural areas. Most of the work of the Joint Subcommittee on Development and Research dealing with the inductive influence of power distribution systems has been concerned with the relatively short and heavily loaded 2300 and 4000-volt feeders employed in urban and suburban areas. The types of circuits encountered in rural service are in marked contrast to those found in more thickly built up areas in that they are usually much longer, are lightly loaded and frequently operate at voltages of the order of 13 kv.

During the summer of 1935, representatives of Project Committee No. 1C* cooperated with various operating companies in Iowa and Nebraska in a study of the inductive influence of a number of 13 kv three-phase, four-wire rural distribution circuits. This situation was particularly valuable in that it offered facilities for comparative tests with the neutral conductor (1) grounded at one point only at the source of supply (uni-grounded) and (2) grounded at a number of points throughout the length of the circuit (multi-grounded). The test program included measurements of the noise induction on telephone circuits exposed at roadway separation to these distribution circuits for each of the two conditions of grounding.

The results of this study are presented in Provisional Report No. 18** entitled "Inductive Influence of 13 Kv 4-Wire Rural Distribution Circuits—Interim Report." Since these results were obtained on only two of the several types of systems which are employed for rural distribution, and at a limited number of locations, it is felt that additional field study, supplemented by a theoretical investigation of certain aspects of the problem, will be required before a comprehensive report on the subject can be prepared. The results of the Iowa and Nebraska tests indicate that there are significant differences between the rural and urban four-wire system from the standpoint of inductive coordination. These results are being made available at this time in order to provide certain information which may be useful in considering this type of problem.

For the conditions investigated, the induction was generally controlled in both uni-grounded and multi-grounded cases by the ground-return currents in the power circuits to which they were exposed. Multi-grounding the neutral materially increased the amount of 60 and 180-cycle currents returning in the ground, but on the average slightly reduced the components of higher frequency.

Noise on all types of telephone circuits exposed to the rural power circuits tested was generally controlled by frequencies above 180 cycles. The change in observed noise when the power circuits were multi-grounded was generally proportional to the change in the higher frequency components of the ground-return current. The results of a general study of the noise conditions on rural telephone circuits in the vicinity of Council Bluffs indicated some improvement in the overall noise conditions when the power circuits were multi-grounded, although the noise in certain exposures was increased.

Results of a brief study carried out in Texas on the comparative effect of uni-grounded and multi-grounded operation of a 7.2-kv single phase line were in agreement with the results obtained in the Iowa and Nebraska tests.

*Of the Joint Subcommittee on Development and Research.

**Price $.60 to members, $1.50 to non-members.

## INDUCTIVE COORDINATION

By L. J. Corbett. A text book giving an overall treatment of the more common problems of inductive coordination. 152 pages. Price $3.00. J. H. Neblett Pressroom, Ltd., San Francisco, California.

THIS BOOK contains an explanation of the factors involved and shows how certain calculations can be made, and gives some of the measurements which are applicable to power and communication circuits for the solution of inductive coordination problems.

In the text proper, extensive calculations such as are sometimes performed in the study of particular inductive situations, are purposely avoided, as in many instances they are not warranted because of the wide variation of those circuit characteristics which affect the results. In the Appendices are added a few methods of calculation which may at times be useful. The broad principles set forth should be a guide, perhaps sufficient in many cases, and will at least indicate with some assurance where more intensive studies may be made with profit. This book gives the reader a general knowledge of the subject, which otherwise he would have to sift out of a vast literature.

Though writing mainly from the standpoint of the power engineer, the author has shown, sympathetically, the problems of the communication engineer which are involved. It is expected that the book will contribute to their fuller understanding of each others problems.

# PUBLICATIONS OF THE INSTITUTE

| *Pub. No.* | | *Date Issued* | *Price to Members* | *Price to Non-Members* | *Price to Foreign Countries* |
|---|---|---|---|---|---|
| D1 | The Objective Type Rates; 1933-1936 | (4/36) | $0.80 | $2.00 | $2.15 |
| D2 | The Electric Light and Power Industry in 1935 | (6/36) | .30 | .75 | .85 |
| C4 | Boilers, Economizers, Air Heaters and Piping—1935 | (7/35) | .60 | 1.50 | 1.60 |
| C5 | Turbines, Condensers and Feedwater Heaters—1935 | (7/35) | .40 | 1.00 | 1.10 |
| C6 | Combustion—1935 | (8/35) | .80 | 2.00 | 2.50 |
| C7 | Air Conditioning—1935 | (9/35) | .50 | 1.25 | 1.35 |
| C8 | Oil and Gas Engines—1934-1935 | (10/35) | .50 | 1.25 | 1.35 |
| C9 | Methods of Measuring Radio Noise | (11/35) | .15 | .35 | .45 |
| C10 | Symbols for Metering Diagrams | (12/35) | .10 | .10 | .10 |
| C11 | Cable Operation—1934 | (12/35) | .60 | 1.50 | 1.60 |
| C12 | Twelve Messages on Accident Prevention in the Electric Public Utilities | (12/35) | .10 | .10 | .10 |
| C14 | Resuscitation Charts | (4/36) | 1-10 copies<br>10-100 copies<br>100-1000 copies<br>1000 or more | .10 each<br>.05 each<br>.04 each<br>.03 each | |
| B1 | Electric Service for Oil and Gasoline Pipe Line Pumping | (3/34) | .10 | .25 | .30 |
| B2 | Air Conditioning—1934 | (5/34) | .75 | 1.85 | 2.00 |
| B3 | Condensers, Feedwater Heaters, Evaporators, and Boiler Feed Pumps—1934 | (6/34) | .45 | 1.15 | 1.25 |
| B4 | Turbines—1934 | (6/34) | .40 | 1.00 | 1.10 |
| B5 | Station Piping—1934 | (7/34) | .60 | 1.50 | 1.60 |
| B7 | Oil and Gas Engines | (8/34) | .40 | 1.00 | 1.10 |
| B8 | Steam Generation | (8/34) | .60 | 1.50 | 1.60 |
| B9 | The Electric Light and Power Industry in 1933 | (10/34) | .30 | .75 | .85 |
| B10 | Electrical Energy Diversion | (10/34) | .20 | .50 | .55 |
| B11 | Cable Operation—1933 | (12/34) | .60 | 1.50 | 1.60 |
| B12 | A-C Network Operation—1932-1933 | (12/34) | .40 | 1.00 | 1.10 |
| A2 | Station Piping | (8/33) | .60 | 1.50 | 1.60 |
| A3 | Turbines | (8/33) | .75 | 1.85 | 2.00 |
| A4 | Burning of Liquid and Gaseous Fuels | (7/33) | .30 | .75 | .85 |
| A5 | Power Station Chemistry | (7/33) | .40 | 1.00 | 1.10 |
| A6 | Pulverized Fuel | (8/33) | .75 | 1.85 | 2.00 |
| A7 | Stoker Equipment and Furnaces | (8/33) | .60 | 1.50 | 1.60 |
| A9 | A-C Networks Operation—1931 | (7/33) | .20 | .50 | .60 |
| A10 | Cable Operation—1932 | (8/33) | .45 | 1.15 | 1.25 |
| A11 | Load Area Development | (7/33) | .30 | .75 | .85 |
| A12 | Fault Locating Methods Used on Underground Cable Systems | (7/33) | .40 | 1.00 | 1.10 |
| A13 | Power System Wave Shape | (7/33) | .20 | .50 | .60 |
| A14 | Current Carrying Capacity of Impregnated Paper Insulated Cable | (7/33) | .25 | .65 | .85 |
| A15 | Electric Roasting Ovens | (8/33) | .20 | .50 | .60 |
| A16 | Load and Revenue Forecasting | (7/33) | .30 | .75 | .85 |
| A17 | Promotion of Home Air Conditioning | (8/33) | .20 | .50 | .60 |
| A18 | Economic Design of Hydro-Electric Plants | (8/33) | .20 | .50 | .60 |
| A19 | Hydraulic Governors | (8/33) | .20 | .50 | .60 |

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The prices include mailing charges. Member prices apply to employees of company members of the Institute. Please send money order or check with order. Orders should be addressed to—

EDISON ELECTRIC INSTITUTE
420 Lexington Avenue, New York, N. Y.

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The Institute has in stock a limited number of reports prepared by Engineering Committees of the former National Electric Light Association during the past several years. A price list will be forwarded upon request.

# POWER SALES ITEMS

## AIR CONDITIONING

"Ballroom Air Conditioning System," by F. W. Rabe. *Heating Piping & Air Conditioning,* June, 1936, p. 315. Keeney Publishing Company, Publishers, 6 North Michigan Avenue, Chicago, Illinois.

Design and control complicated by varying day and night heat loads.

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"Solving the Four Types of Process Air Conditioning Problems," by William Goodman. *Heating, Piping & Air Conditioning,* June, 1936, p. 323. Keeney Publishing Company, Publishers, 6 North Michigan Avenue, Chicago, Illinois.

Problems typical of each division and solutions by the psychrometric chart explained.

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"Innovations in Air Conditioning Introduced in Glass Laboratory." *Aerologist,* March, 1936, p. 16. Aerologist Publishing Co., Inc., 666 Lake Shore Drive, Chicago, Ill.

This artcile gives a description of the air conditioning system installed in the new windowless, glass block laboratory of the Owens-Illinois Glass Company at Toledo, Ohio.

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"The Installation of Air Conditioning Resulted In An Immediate Increase in Busi; ness." *Electrical South,* June, 1936, p. 18. W. R. C. Smith Publishing Company, Publishers, Grant Building, Atlanta, Georgia.

This article describes the air conditioning installation in the Belmont Cafe at Jackson, Mississippi. This was the first restaurant in the State to be completely air conditioned. The refrigerating machine is a twin compressor type with 3 cylinders on each side and with a 15 hp motor between them. No estimate of increased business is given but owners are highly pleased with results.

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## DIESEL ENGINES

"Cost of Generating Power in Diesel Plants." *Diesel Power,* June, 1936, p. 354. Diesel Publications, Inc., 192 Lexington Avenue, New York City, Publishers.

Preliminary Oil Engine Power Cost Report of the ASME.

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"Ponca City Diesel Plant Sets Low-Cost Record," by Patrick Schlesinger, Superintendent, Light and Water. *Diesel Power,* June, 1936, p. 356. Diesel Publications, Inc., Publishers, 192 Lexington Avenue, New York City.

Small article reporting total operating cost of 4.30 mills/kwhr with the 4-1250 hp Nordberg Diesel engines—efficient, reliable and free from operating troubles.

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"Meeting Textile Competition With A Diesel Power Plant." *Diesel Power,* June, 1936, p. 358. Diesel Publications, Inc., 192 Lexington Avenue, New York City. Publishers.

Description of principal equipment used in the Diesel plant of William E. Hooper & Sons, Baltimore, Maryland, which has total operating cost of 4.83 mills/kwhr.

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"Ferguson Brothers' Craftsmanship Extends to its Diesel Plant," by Frank Kiel. *Diesel Power,* June, 1936, p. 360. Diesel Publications, Inc., Publishers, 192 Lexington Avenue, New York City.

Principal equipment of the plant which has total operating cost of 6.79 mills/kwhr and which was installed in 1933.

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"Greenville, Texas, Records 4.87 Mills Total Operating Cost per kwhr." *Diesel Power,* June, 1936, p. 362. Diesel Publications, Inc., Publishers, 192 Lexington Avenue, New York City.

Principal equipment of the plant installed in 1933 which has a load factor of 56 per cent.

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"Selling the Diesel to the Public." *Diesel Power,* June, 1936, p. 399. Diesel Publications, Inc., Publishers, 192 Lexington Avenue, New York City.

Purchase of Diesel engines is now three times the record of 1928. Primarily promotional methods such as articles in trade and engineering magazines, addresses before engineering and business associations, radio broadcasting, and movies are responsible.

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## ELECTRIC FURNACES

"Electric Furnaces and Their Part in Metallurgical Progress," by Frank R. Palmer, *Iron Age,* June 4, 1936, p. 32. Iron-Age Publishing Company, Publishers, 239 West 39th Street, New York City.

To the utility engineer interested in arguments demonstrating the superiority of electric furnace metal melting, this article is a gold mine of useful data.

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## ELECTRIC MOTORS

"Applying Synchronous Motors to Main Roll Mill Drives," by L. A. Umansky, General Electric Company, Schenectady, N. Y. *Iron and Steel Engineer,* June, 1936, p. 1. Association of Iron and Steel Electrical Engineers, Publishers, 1018 Empire Building, Pittsburgh, Pa.

Paper on the adaptability of synchronous motors to mill drives with their characteristics, and comparison with induction motors.

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"Operating Characteristics of Synchronous Motors," by Gordon Fox. *Power Plant Engineering,* June, 1936, p. 350. Technical Publishing Company, Publishers, 53 West Jackson Blvd., Chicago, Illinois.

Effect of excitation. Comparison with induction motors. Variation of power factor load. Power factor correction, methods of calculation. Operation of synchronous motors at constant power factor.

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## FUELS

"Present Day Diesel Fuels and Fuel Specifications," by T. M. Robie. *Power Plant Engineering,* June, 1936, p. 338. Technical Publishing Company, Publishers, 53 West Jackson Blvd., Chicago, Illinois.

Introduction of the high speed engine and new refining methods complicate the diesel fuel problem.

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## POWER SALES

"Power at Work in Industry." *Electrical World,* June 20, 1936, p. 64. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City, Publishers.

Five items which contain ideas for power sales:

Keeps coal flowing from storage silo.
Electric heat aids sealing of batteries.
Flicker reduced by new reactor starter.
Electrodes coated in conditioned air.
To heat cleaning solution in garages.

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"Lighting Load de Luxe." *Electrical World,* June 20, 1936, p. 29. McGraw-Hill Publishing Company, Inc., Publishers, 330 West 42nd Street, New York City.

Description of the lighting and air conditioning installations at the windowless Hershey office building which cost less to build and operate than a conventional office building.

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"Industrial Load Building." *Electrical World,* May 23, 1936, p. 94. McGraw-Hill Publishing Company, Inc., Publishers, 330 West 42nd Street, New York City.

Interesting methods and reports on selling industrial load with emphasis on cooperation of press, industry and utility, especially the latter among themselves. Some new loads mentioned are electro-plating zinc to steel by means of 40,000 amps, refining ore by electrostatic and electromagnetic means, and simplification of manufacture of plyboard with 1500 kw in electric heat.

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"Hyatt Signs Pact With Public Service." *Electrical World,* May 23, 1936, p. 136. McGraw-Hill Publishing Company, Inc., Publishers, 330 West 42nd Street, New York City.

Small notice that a General Motors subsidiary, Hyatt Rolling Bearing, abandoned its 7500 hp plant in favor of purchased power.

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## RATES

"Rate Reductions," by W. G. Vincent. *Electrical World,* June 6, 1936, p. 1756. McGraw-Hill Publishing Company, Inc., Publishers, 330 West 42nd Street, New York City.

Some record figures to show how well the industry has served. An analysis of false conclusions on rates. Practical aspects of rate making.

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## STEEL MILLS

"Ford's Steel Mill," by Frank R. Innes, Western Editor, *Electrical World,* May 9, 1936, p. 47. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Description of the electrical end of this modern mill installation with new ideas in air cooled roll tables, bus bar construction, and the like.

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"Notes on the Efficient Pickling of Iron and Steel," by C. H. McCollam and D. L. Warrick. *Metal Progress,* May, 1936, p. 61. American Society for Steel Treating, Publishers, 7016 Euclid Avenue, Cleveland, Ohio. New York: 25 West 43rd Street.

The power sales engineer contacting the iron and steel industries should be familiar with the general features of pickling, a term applied to the chemical removal of surface oxides from metal by immersion in an acid solution. The present article gives a broad outline of the methods and difficulties encountered in most pickling operations met with in industrial applications.

# Novel Ideas to Stimulate I.E.S. Lamp Campaign

THE Rocky Mountain Electrical Association has originated a series of unique ideas for stimulating industry-wide interest and participation in its fall and winter I.E.S. lamp campaign throughout Colorado, New Mexico and Wyoming. Several stages of the singular program already have been perfected; others will be launched as dominating features of the Association's annual convention, in Santa Fe, New Mexico, September 21 to 23.

Every delegate to the convention, according to Association Manager George E. Lewis, will sign a Sight-Saving pledge. This pledge will be incorporated in the identification badges which will be issued to indicate payment of the required registration fees.

### I. E. S. Tags As Convention Badges

These novel badges will be enlarged replicas of the official I.E.S. tags, with space on both sides for the names of their wearers. The name on one side is placed on the tag in such a manner that it constitutes a signature to the Sight-Saving pledge.

*Irving Elwood Storey of Denver, original I. E. S. baby, and the nation's largest I. E. S. tag, which will be used as a campaign emblem during the fall lamp-sales activity of the Rocky Mountain Electrical Association and Electrical League of Colorado.*

*Little Irving was introduced to this world at the same time the I. E. S. lamp was introduced—October, 1934. Therefore, he will celebrate his second anniversary during the same month when the industry will observe the second anniversary of the I. E. S. lamp.*

## CONVENTIONS AND MEETINGS

**AUGUST**

31 Illuminating Engineering Society, Statler Hotel, Buffalo, N. Y.

**SEPTEMBER**

1- 3 Illuminating Engineering Society, Statler Hotel, Buffalo, N. Y.
7-12 Third World Power Conference, Washington, D. C.
9-11 Pennsylvania Electric Association, Bedford Springs Hotel, Pa.
9-19 National Electrical and Radio Exposition, Grand Central Palace, New York, N. Y.
12-13 Maryland Utilities Association, George Washington Hotel, Ocean City, Md.
18-19 West Virginia Public Utilities Association, White Sulphur Springs, W. Va.
20-23 American Transit Association, White Sulphur Springs, W. Va.
21-23 Rocky Mountain Electrical Association, Sante Fe, N. M.
22-25 Association of Iron and Steel Electrical Engineers, Detroit, Mich.

**OCTOBER**

1- 2 Empire State Gas & Electric Association, Saranac Inn, N. Y.
1- 2 Indiana Electrical Association, French Lick, Ind.
4- 9 National Electrical Manufacturers Association, Netherland Plaza Hotel, Cincinnati, Ohio.
7-10 Electrochemical Society, Niagara Falls, Ont.
8- 9 Transmission and Distribution Committee, E.E.I., Memphis, Tenn.
26-27 Electrical Equipment Committee, E.E.I., Sagamore Hotel, Rochester, N. Y.
26-30 American Gas Association, Atlantic City, N. J.

**NOVEMBER**

30 American Society of Mechanical Engineers, New York, N. Y.

**DECEMBER**

1- 4 American Society of Mechanical Engineers, New York, N. Y.

# Empire State Association Convention

THE two-day Annual Convention of the Empire State Gas and Electric Association will be held at Saranac Inn, Saranac Inn P. O., New York, on Thursday, October 1st, and Friday, October 2nd.

Business sessions will occupy the two morning periods with recreation and amusement in the afternoons and evenings.

A splendid program will include an address by the President, E. R. Acker, with addresses also by the Presidents of the American Gas Association and the Edison Electric Institute. Alfred H. Schoellkopf, President of the Niagara Hudson Power Corporation, will speak on "Rural Electrification"; J. P. Haftenkamp, Vice-President of the Rochester Gas & Electric Corporation, will speak on "The Gas Business and Competition." A paper on "The Social Security Act, and Employee Benefit Plans" will be presented by M. B. Folsom, Treasurer, Eastman Kodak Company, international authority on this subject. Colonel Charles G. Blakeslee, formerly Counsel for the Public Service Commission, will speak on "Legal Phases of Commission Regulation." H. C. Davidson, Secretary of the Consolidated Edison Company, will speak on "Accounting Regulation," and a paper on "Employee Training and Public Relations" by H. C. Theurk of the Utility Management Corporation. Samuel Botsford, Managing Director of the Buffalo Chamber of Commerce, will close the session with a talk on "New York—the World's Greatest Market."

On Thursday afternoon there will be a handicap golf tournament on one of the finest courses in the Adirondacks.

A dinner-dance Thursday evening with various kinds of entertainment will be offered for those enjoying this form of relaxation.

Boat rides, putting and bridge are planned for the ladies Thursday and Friday afternoons.

The Convention is in charge of a committee with Mr. Charles A. Tattersall, Assistant Vice-President of the Niagara Hudson Power Corporation, as chairman.